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THE EAST COAST OF INDIA

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Map facing p. 92.

Introduction. The East Coast of India has been known to geographers for a long time as a low lying stretch of land bordered on the west by mountains which stretch from near Cape Comorin on the south to the Ganges plain on the northeast, and on the east by a shallow water seaboard that makes shipping difficult and at times dangerous if not impossible. This low lying land is known geographically as the Carnatic. More detailed accounts of certain parts are given in government publications. In those of the Geological Survey of India are a number of articles that deal with east coast structures written in the earlier history of the Survey by Mr. R. Bruce Foote and Mr. William King.* These deal with the older formations admirably, in a geologic way, but give only hints concerning physiographic forms and processes. In the District Gazeteers, government publications dealing with numerous aspects of the country and people in the separate districts,† one might expect to find the geography

* Records of the Geol. Survey of India, 1870, Vol. III, p. 11, Foote; 1886, Vol. XIX, p. 143, King; Memoirs of the Geol. Survey of India, 1873, Vol. X, Part 1, Foote; 1880, Vol. XVI, Part 1, Foote; Part 2, King; Part 3, King.

† The "district" in India is analogous to our "state."

of the East Coast definitely treated. In these reports, however, the geology is transcribed from the articles already referred to, the physiographic aspects are treated empirically, if at all, and the geographic phases are in general presented as isolated items.

It was because of this condition in the geographic literature of the East Coast of India, and because the hints it afforded seemed to promise abundant reward to the investigator, that the writer was sent to this section for the academic year of 1910-11 by Harvard University, as a Sheldon Traveling-Fellow for research in geography. The work was proposed by Professor W. M. Davis, and generous leave of absence was granted by Principal J. Asbury Pitman of the State Normal School at Salem, Massachusetts.

The East Coast of India is over 1,200 miles long, a distance as great as from eastern Maine to northern Florida, and the low lying tract itself has an average width of about forty miles. Obviously it was impossible to examine the whole of the area with any degree of care in the time allotted. The first part of the work, therefore, resolved itself into selecting certain sections of the plain that were typical of long reaches and different from one another. This necessitated a hasty reconnaissance of the whole area, followed by intensive study of the chosen sections.

Conditions of Work. The work was greatly facilitated by the helpful attitude of the officials of the Indian Government. Following the suggestion of the Indian Geological Survey, the Government of Madras issued a general order to the heads of the various districts and their subordinates, to give all possible assistance to the undertaking. American and European missionaries who are well distributed along the East Coast in relation to the larger centers, did much to forward the work and make it pleasurable, by giving advice concerning local conditions and offering hospitality of the renowned oriental sort. Then, too, the natives themselves assisted materially by their willingness to talk of their life—the use they make of their environment, and with rare exceptions, by their eager friendliness. The primitive condition of most of the people made the investigation of the life side of the problem easy, except where the influence of the environment is counteracted by that highly complicated and artificial set of rules of conduct, the caste system.

Another point of advantage in the work lay in the fact that the greater part of the whole area investigated is free from obstructing vegetation, so that one can observe from long distances land forms that would otherwise be inconspicuous. The work had been planned

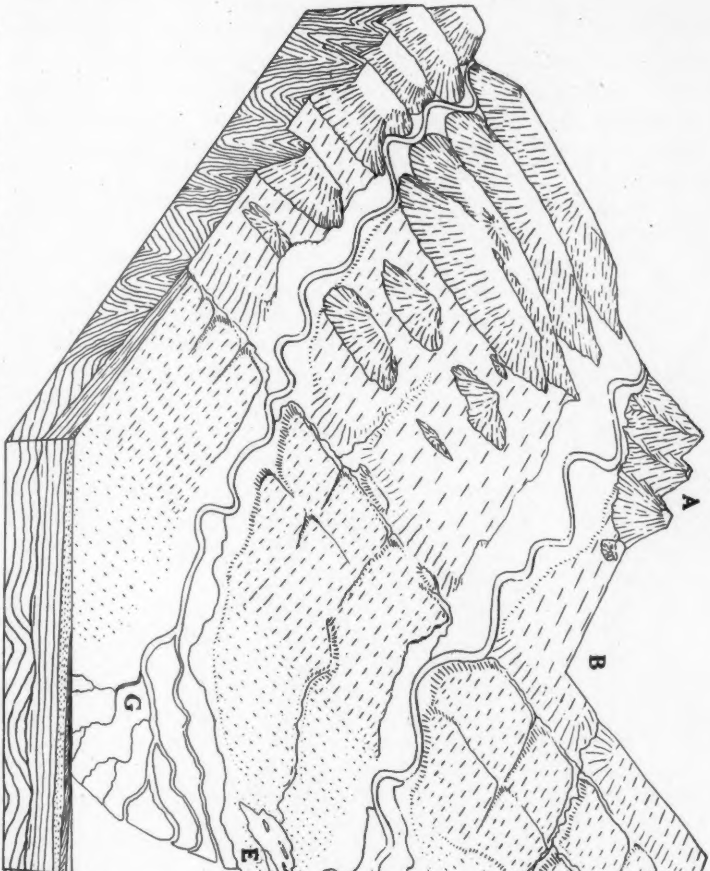

DIAGRAM 1—Block diagram of a generalized section of the east coast of India. A, elevated peneplain, the Eastern Ghats. B, plain of marine denudation with outliers. C, mature coastal plain. D, young coastal plain. E, strand plain. F, Bay of Bengal. G, type deltas.

for the dry season and the advantage this gave was greater than had been anticipated. The fact that every day was a full working day, except as temperature forbade, and a day when photographic exposures might be made at any hour, can be fully appreciated by those who have experienced the inconveniences of field work in the variable westerlies. The greatest single assisting agent was the railroad that runs the full length of the East Coast and has a number of lateral feeders. Without it the work of days would have been distributed over weeks.

On the other hand, progress was retarded by that all-pervasive oriental lassitude that makes itself evident in meal service, in the work of coolie porters, in the deliberation of petty native officials—in fact whenever the needs of a traveler in India are dependent upon native life—a quality which arouses in the occidental mind a high degree of impatience until it is understood as an environmental product. Primitive means of transportation away from the railroads was another hindering element. The only way of getting about, in many places away from the few large centers, was by two-wheeled carts drawn by bullocks that averaged two and one-half miles per hour. In other sections it was necessary to use elephants because of lack of roads or their need of repair. The surf is so high generally along the coast, owing to the gently sloping sea floor, and roads are so few that much of the coast region could be reached only by houseboats under sail along back water canals, blown by trade winds by day and drawn by coolies at night when the trades weakened. The uncleanliness of the people, their inability to supply food suitable for one accustomed to a civilized diet, and the danger of fever bacteria in unboiled drinking water, necessitated carrying a complete camp equipment. As the hot season approached it was found impossible to carry on field work during the mid-day.

Nomenclature. The term "Eastern Ghats" usually designates the "mountains" parallel to the east coast as far south as the Palghat Gap, west of Trichinopoly. (Map, Fig. 1*.) This paper follows a rarer use; here the term is applied as well to the eastern part of the high lands that continue beyond the Gap to Cape Comorin. This part would seem to deserve to be included under that title, for it is the same as the other in form and structure.

The term "Carnatic" has evolved through numerous stages, until now it is applied by the English to mean the low lying land in Southern India on the East Coast, that extends from the foot of the

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* Map facing p. 92.

Ghats to the sea. The northern limit varies in use. Geography would do well to appropriate the term for designating the plains bordering the Bay of Bengal southwest of Calcutta. This would require only a slight expansion of the local application; and it would then stand for a physiographic unit, as will be shown later.

"Coromandel" was used anciently to designate a political division; literally, the land of the Cholas. In early British correspondence it applied to the coast in the vicinity of Madras. Later it stood for the eastern coast of the Madras presidency. In a recent publication for mariners on the ports of India, Coromandel designates, by inference, the whole of the east seaboard, as Malabar does the west. Geography can approve of the last use for it is definite, stands for a coast of uniform character, with minor exceptions that are noted below, and is better than "east seaboard," for that term might be interpreted as the Burmese coast, now that political India includes Burma.

Thus it may be said that this paper treats of the Eastern Ghats, the Carnatic, and the Coromandel.

Physiographic Summary. There extends along the East Coast of India from Cape Comorin to near Calcutta, and from some sixty miles inland to the Bay of Bengal, a strip of country that is made up successively, from west to east, of an elevated peneplain of highly distorted rocks that is nearing maturity, an ancient sea cliff, a plain of marine denudation from which rise many outliers, a mature coastal plain the soil of which is "lateritic," and a young coastal plain whose continuity is interrupted by numerous large deltas and whose coast is fringed with narrow strand plains, sand bars and islands. (Fig 1.)

The Elevated Peneplain. Wherever the Eastern Ghats are climbed the comparative evenness of the summits as contrasted with the valley slopes and the attainment of the same general altitude by the ridges and hills are striking features. (Figs. 2 and 5.) They are even more so when it is ascertained that the structures have no relation to these conditions. In the absence of evidence that marine agents developed such a gently rolling initial surface, such as patches of locally derived marine sediments, resort must be made to subaerial forces as causal agents, and the conclusion is reached that this land form, the Eastern Ghats, is an elevated peneplain.

The peneplain has been developed over metamorphic structures mainly. They are represented by numerous schists, gneisses, and quartzites. Wherever the resistant gneisses and quartzites prevail

over large areas or the less resistant members extend in sections where the rivers are wide spaced, the peneplain is still in a youthful stage of dissection, in spite of its ancient elevation. It has been carried past maturity toward old age wherever master streams have established low base levels among the weaker members, as shown in Figs. 3 and 4. Between these two extremes there are all varieties of stages. The master rivers have intrenched meandering courses in the elevated peneplain and a well developed series of subsequent tributaries have evolved a corresponding series of structural ridges. The destructive forces that hewed out the plain to the east that accompanied the invasion of the sea, were evidently halted by highly resistant members, for in many cases the seaward ridge of the Ghats preserves the greatest altitude. The strike of the metamorphic structures is sub-parallel to the coast; thus it follows, that in the maturely dissected Ghats the ridges are sub-parallel to one another and the coast and the master streams are transverse. The average height attained by the peneplain is over two thousand feet; while the maximum, which it reaches in the southwest of Madura, is over six thousand feet. From the peneplain numerous monadnocks rise, some attaining altitudes of eight thousand feet. These are usually of the most resistant portions of the strong members of the metamorphic series. They hint at the depth of rock removed by the denuding agents to produce the peneplain.

The ancient sea wall which forms the eastern slope of the Ghats is shown to be such by its relation to the plain of marine denudation, both being carved out of the same structure already referred to in considering the peneplain, and by a lack of those characteristics which indicate a fault scarp. The word "ghat" means in Hindu "landing-stairs from a body of water." This derivative meaning well applies in likening the old sea cliff to a flight of stairs, or the cliff and the peneplain to the rise and tread respectively of a stair-step. It is seen that the full meaning applies to a nicety in describing the conditions when the sea was at work at the base of the cliff.*

The sea wall is boldest in the south near Kodaikanal, a sanitarium and hill station for South India missionaries, where it rises from the inner margin of the Carnatic to an altitude of over 7,200 feet with an average slope of 32°. (Fig. 5.) In many places it approaches the

* This is not intended to suggest, however, that the application of the term indicates the recognition of early geologic conditions, on the part of the Hindus, though they have a pretty legend concerning similar relations to the Western Ghats that coincides with the views of geology. This is given in "Malabar and Its Folks," by T. K. Gopal Panikkar, 1900, Chap. I.

FIG. 2—Northwest of Rajamundry in the elevated peneplain, on the largest river that is entrenched in the Eastern Ghats. The peneplain surface is indicated by the even-crested mountain ridge. Here it has an altitude of 2,700 feet.

FIG. 3—On the elevated peneplain southwest of Madura. Here erosion has destroyed the peneplain surface except in small patches.

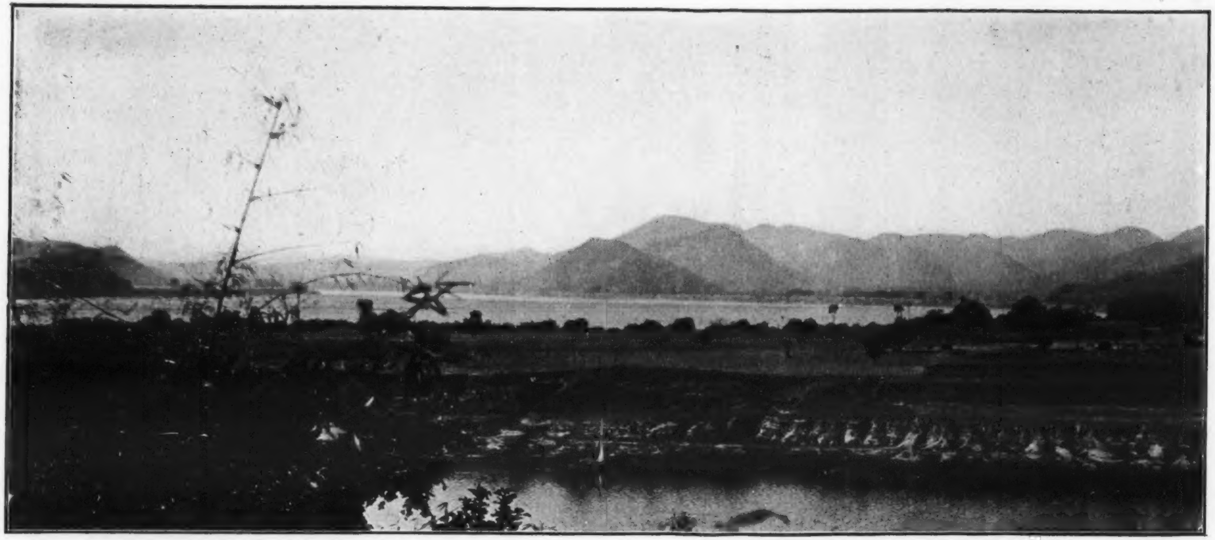


Fig. 4—A less resistant portion of the elevated peneplain bordering the Godavari River, showing advanced dissection and the development of a broad, fertile flood plain.

"sheer precipice" so much recorded in general literature, and so little found in nature. It is so formidable that a bridle path is the only means of ascent. It would seem that the weaker members here underlying the resistant structures permitted the sea to develop a steep sea wall and the drainage of the peneplain to the west helped to preserve it in that condition. In northern sections where the peneplain has a lower altitude the sea wall is less striking in height, and those conditions which gave the peneplain a mature dissection permitted the adjoining sea wall to develop a gentle slope. The sea through its long continued action at the base of the wall searched out the less resistant structures, and with the help of the other denuding agents, made it retreat most where weakest and most exposed; so the sea wall to-day is irregular and fragmentary as is shown in Figs. 6, 7 and Diagram 2.

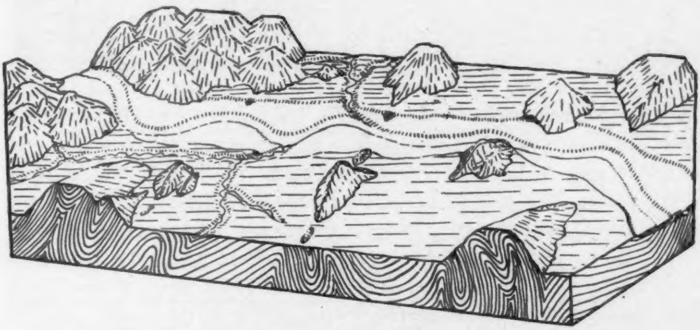


DIAGRAM 2—Block diagram of the plain of marine denudation and its associates, showing some of the finer details.

The Plain of Marine Denudation. The plain of marine denudation, as has been noted above, has been developed in the same metamorphic structures that underlie the peneplain. Because of its low lying altitude and meager rainfall it has been little dissected. In fact the large extended consequent rivers are about the only ones that have disturbed seriously the continuity of the original surface. Even these are in such shallow courses that many have to be "bunded" to prevent the rivers from overflowing the plain during the season of rains. The surface of the plain in extensive sections has become thoroughly "lateritized," *i. e.,* changed to a ferruginous material, in which certain constituents have been replaced by others. This passes by insensible gradations to the unweathered rock which may be less than a foot from the surface. Drainage

ditches along railroads in this belt of country reveal the gradation for hundreds of miles.

There are two striking features of the plain of marine denudation: one is the remarkable evenness of the surface in view of the distorted structures over which it extends; and the other, the prevalence of high steep-sided outliers on the plain. (Diagram 2 and Figs. 8 and 9.) These two features seem to be inconsistent with one another, for if the sea were unable to consume the outliers because of their more resistant material, it would be reasonable to expect an uneven surface to the plain, the minor inequalities of the surface resulting from unconsumed portions of resistant structures. It might be explained, by inferring from this condition and further evidence of structures in the field, that the quartzite of the outliers is separated widely in resistancy from the schists and gneisses of the plain. Wherever metamorphism had developed a fold of quartzite there remained, in the path of the transgressing sea, an outlier to record it. As the sea wall is approached the outliers are more numerous. Those that are near the wall are tied to it by old sand bars and cobble trains, evidently preëlevation beaches. They are rare in the north and south extensions of this plain, and increase rather regularly in numbers toward the center from Bezwada to Vizágápatam and beyond, where they may be said to occupy about eight per cent. of the area. Elevated sea-caves at their bases are not uncommon. (Fig. 11.)

In some sections, particularly those where they are comparatively thick set, the outliers are of about equal heights and have flat summits.* If one is climbed it is seen that the summits lie in the same plane, and further, that this plane, if projected landward, coincides with the elevated peneplain. It dips gently to the southeast or seaward. (Fig. 8.) Here then is an evident memorial to the former extension of the peneplain before the marine erosion, that generated the plain of denudation and the sea wall, and also a convincing demonstration that the limiting wall of the Eastern Ghats is not a fault scarp.

Mature Coastal Plain. Seaward of the denudation plain is a coastal plain of shales and sandstones, containing marine fossils. It dips about 6° to the southeast. This coastal plain has reached maturity in those sections which were lifted most above sea level. This occurred in the central stretches of the East Coast, from Madras to Rajamundry, where the inner margin must have stood

* This relation of the outlier summits was first recorded by William King in the "Memoirs of the Geological Survey of India," Vol. XVI, Pt. 3, p. 10. He interpreted the flat summits as "remnants of a deeply denuded old marine floor."

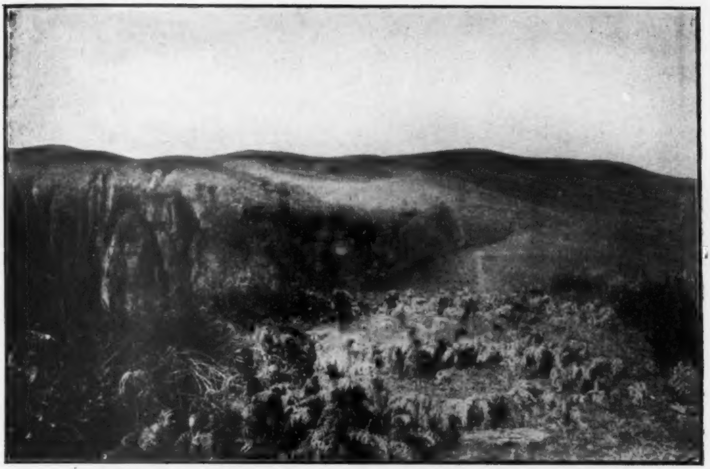


FIG. 5—At Kodaikanal west of Madura. The gently rolling surface of the elevated peneplain contrasted with the crest slope of the ancient sea cliff, shown dimly at the left, which here plunges directly down nearly 7,000 feet to the plain of marine denudation.

FIG. 6—Junction of the elevated peneplain and the infertile plain of marine denudation.

FIG. 7—An outlier, and beyond, the ancient sea wall. Their bases are connected with raised beaches.

FIG. 8—Outliers whose summits record the former extension of the elevated peneplain, near Bezwada on the Kistna River. In the foreground is an irrigation canal. In the right distance large outliers closely grouped show a continuous even sky line suggestive of the perfection of the elevated peneplain before marine invasion

FIG. 9—A bare outlier on plain of marine denudation, near Madura, crowned with a Hindu temple and a Mohammedan mosque.

FIG. 10—A cuesta nose of the mature coastal plain west of Nellore. The Pennar is seen in the distance.

Fig 11—At the base of the outlier in Fig. 9 showing the results of marine erosion. The rim of the cave is sixty-five feet high.

over 130 feet above the present sea level, and where the maximum width of the plain is ten miles. The north and south extensions of the plain take on more and more the characteristics of youth, and finally are indistinguishable in surface features from the landward extension of its foundation, and from a young coastal plain, that will be described below, that overlaps it on the seaward flank. The structure of the mature coastal plain, however, is always individual and prevents confusion with any other feature. It is determined by the influence of alternate wet and dry seasons of weathering, under high temperatures, upon stratified rocks. The effect is a laterite in which the stratification is disguised by concretions, nodules, and small irregular tubes. The whole mass is rendered highly ferruginous by the process so that it has a conspicuous red color in contrast to the light grey sands of the young coastal plain. The surface of the marine denudation plain is sometimes lateritized but here the metamorphic structures are highly persistent.

Mature dissection of the central sections has developed cuestas that overlook inner lowlands which join the plain of marine denudation almost imperceptibly. The lowland has been eroded to and into the basal metamorphics. Insequent streams have made parts of cuestas stand out as headlands (a low one is shown in Fig. 10), from the summits of which excellent views are obtained across the lowland and denudation plain with its bold outliers, and at certain places, to the imposing even-crested sea wall beyond. Insequent erosion has converted a few former headlands into inliers. Extended consequent rivers have opened up wide valleys, thus isolating portions of the plain, and justifying reference to them, by early Indian geologists, as patches of low plateaus.

The gentle seaward slope of this plain ends, in some sections, at the crest of a short, steep slope, from the base of which extends the young coastal plain, as shown in the distance in Diagram 1. This relation would seem to indicate that during the time of deposition of the material of the young coastal plain, the sea consumed much of the mature coastal plain, and left the record of its work in the elevated sea cliff. This cliff is most evident in South India, near Cuddalore, a minor port, where it reaches a maximum height of forty-five feet.

Young Coastal Plain. A young coastal plain is indicated, along the outer margin of the Carnatic, in a little-eroded, nicely stratified, wedge-shaped deposit of unconsolidated sands and clays. (D, Diagram 1.) There are marine fossils in the deposits of the same species

as are now living in the bordering sea. The young coastal plain has an average width of about six miles and a slope of less than 2°. The seaward margin of this plain has the characteristics of a young coast line, *i. e.,* sand bars, lagoons, marshes, etc. Some of the lagoon floors have been raised so high that they are now flooded only during the spring tides of the rainy season. The surface of the plain continues as the sea floor with such a very gentle slope that in some parts a tidal fall of thirteen feet suffices to expose over two miles of sea floor.[1] (Fig. 14.)

Deltas. The most important element geographically of the Carnatic is the delta land. It is this land that produces the larger part of the immense crop of cereals that the lowland yields. The largest of the deltas, that of the Godavari, has an area of a thousand square miles and supports a population of nearly two-thirds of a million. The delta of the Kistna and that of the Cauvery can each boast of almost equal area and population. Most of the other numerous rivers have deltas proportional in size to the area they drain. A glance at the map (Fig. 1), will serve to show how extensive the delta land is. Three conditions seem to favor this rather abnormal delta growth. One is the enormous quantity of water and sediment the rivers of the east coast bring to their mouths. This is accounted for by the size of the basins of these rivers. Their source is so near the west coast that their basin area is not far from the area of peninsular India itself. The second is the small amount of sediment necessary for deposition upon the very shallow sea margin for delta growth. And the third favoring condition is the very gradual uplift that has revealed the young coastal plain. The apexes of most of the deltas are of about the same altitude as the inner margin of this plain, although they are farther from the sea, and it would seem that their growth kept pace with that of the plain.

The Coast. Throughout the twelve hundred miles of the Coromandel, from the mouth of the Hugli, the distributary of the Ganges that connects Calcutta with the Bay of Bengal, to Cape Comorin, the coast land is a low sandy tract, with the exception of a few places in the vicinity of Vizágápatam where outliers come to the sea margin. Sand dunes are common all along the coast. Fig. 14 shows an unusually conspicuous line of them. With the exception of four ledges between Ganjam and Vizágápatam, and two about thirty miles south of Madras, this great stretch of coast has no rocks to interrupt the gently sloping, sandy, sea-margin floor. (Fig. 14.)

Careful measurements of Government Hydrographic Charts of

FIG. 12—From summit of outlier in Fig. 9 looking east across a low lying section of the mature coastal plain, and the young coastal plain. The water areas are irrigation "tanks."

FIG. 13—The bed of a deltaless river in the young coastal plain during the dry season. In the wet season a shallow torrent pours over it.

FIG. 14—Nearly one and a half miles from the coast line near Balasore, showing the very gently sloping expanse of sea floor, at low tide, that borders the young costal plain. A line of sand dunes separates the one from the other. The highest in this view is seventy-five feet.

this coast give the average distance of the ten fathom line as four and one-fifth miles from the shore; of the twenty fathom line, nine and one-half miles; and of the hundred fathom line, nineteen and one-seventh miles. The average distance of the five fathom line from the shore cannot be nicely ascertained from the charts, but an estimate would place it clearly over a mile. These figures indicate in a striking way the gentleness of the slope of the sea floor bordering this coastline of elevation.

In front of the large deltas these sea floor contours are close together, showing that the strong currents that play along the coast, under the alternating influence of the northeast and southwest trades, keep the projecting outer margins of the deltas well trimmed into a steeper slope. The quiet angles at the junctions of delta margins with the young coastal plain border, and especially between nearby deltas, have greatly favored the growth of strand plains. (Diagram 1.) These are clearly distinguished from the young coastal plain by the succession of beach ridges that mark the surface, prevailing cross-bedded structure, and by a lack of slope. When formed between deltas they sometimes enclose lakes as shown at E, Diagram 1.

Conclusion. Such is the general disposition of the physiographic areas along the Carnatic. There are, however, wide departures from this. For example, in the vicinity of Vizágápatam, a port one-third the way along the coast from the north, bold outliers stand forth even to the coast and permit the sea to etch cliffs and caves at their bases. One of these attains 1,500 feet in height. They form a pleasing variant in a coast that is edged with low sandy stretches throughout the rest of its great length. Here the denudation plain

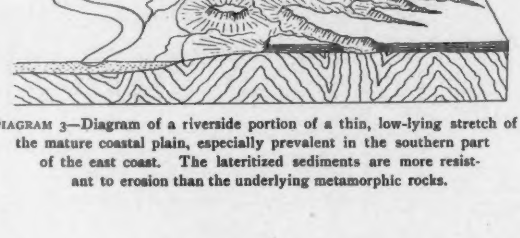


DIAGRAM 3—Diagram of a riverside portion of a thin, low-lying stretch of the mature coastal plain, especially prevalent in the southern part of the east coast. The lateritized sediments are more resistant to erosion than the underlying metamorphic rocks.

extends forty miles before the wall of the Eastern Ghats is reached. There is no evidence of the mature coastal plain. The young coastal plain takes on the new relation of having the denudation plain as a foundation, and articulating with the numerous outliers extending out of it. Here then the material that would have made the mature coastal plain must have been stripped off by the retreating sea, or this part of the section was above sea level during the deposition of the mature coastal plain material elsewhere.

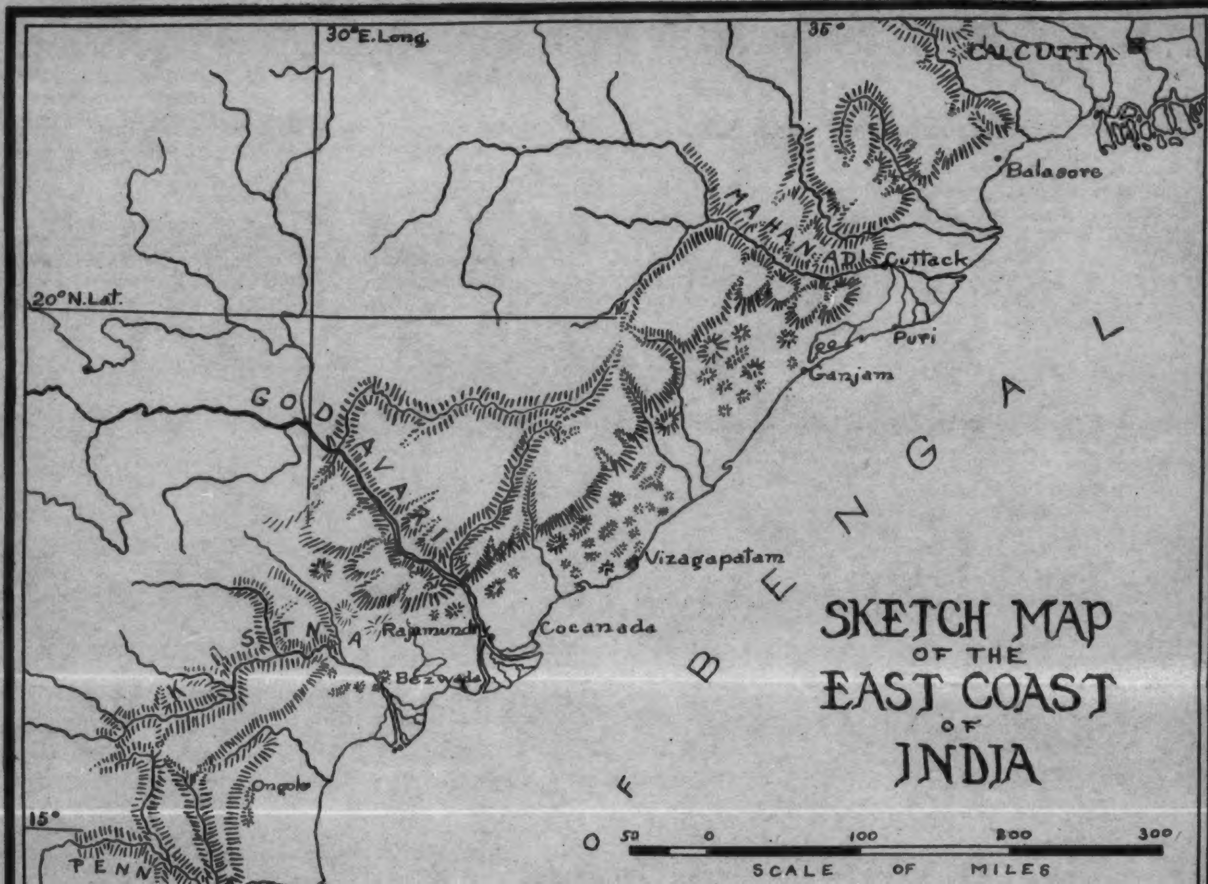
In the Madura section of South India the mature coastal plain is so low lying and its structures are so thin that it loses its most conspicuous characteristics. (Diagram 3.) Toward the inner margin it is represented by thin patches of lateritized sediments that fill shallow hollows of the denudation plain. There is no inner lowland. Outliers are rare here. One may travel long distances without seeing any. The young coastal plain is dwarfed in importance by a broad strand plain. It seems to be a product of the influence of the proximity of Ceylon to the mainland.

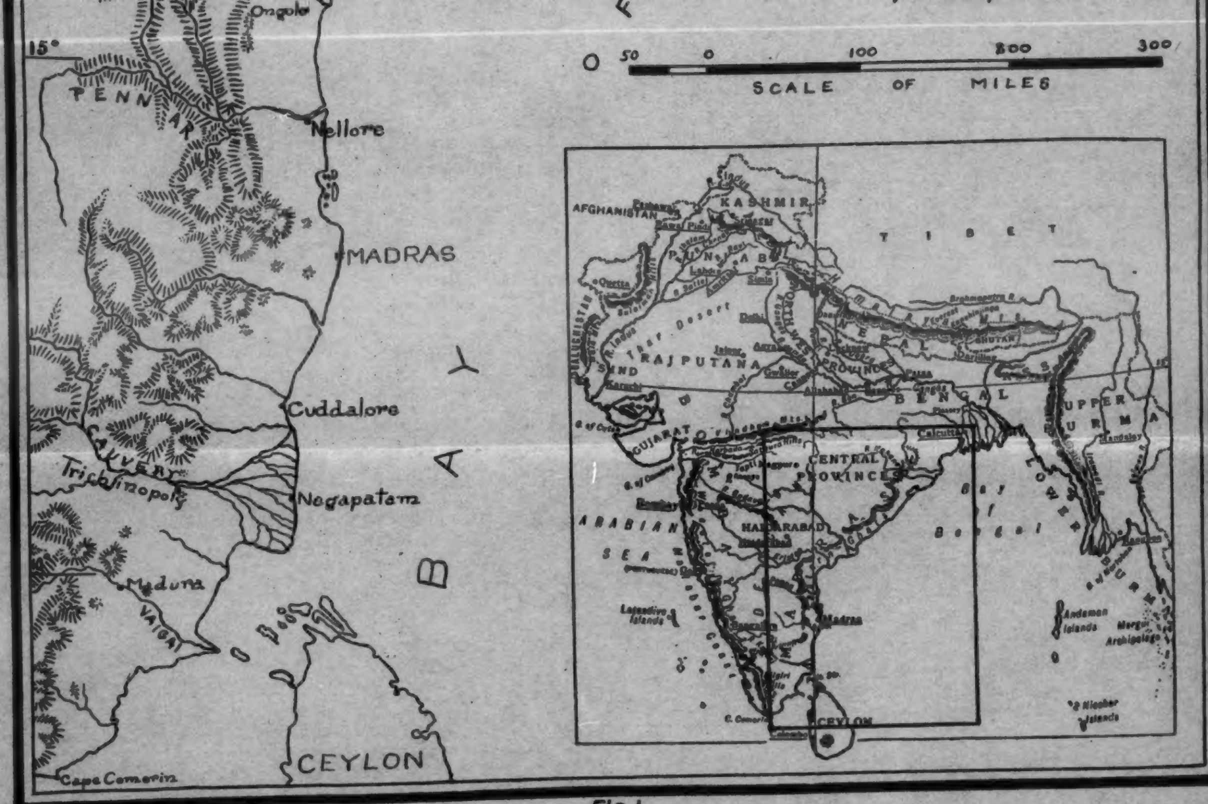
Again, near Madras the young coastal plain has a meager extent. The strand plain, which has had rapid growth since the harbor groins were built, almost outrivals it in width. Here, smaller type outliers invade the territory of the mature coastal plain.

The land forms of the East Coast therefore show clearly the result of a vacillating coast line, and what may be accomplished by the sea, destructively and constructively, under varying conditions of elevation and depression.

The elevated peneplain, marine denudation plain, the mature and young coastal plains, with the deltas, strand plains and islands, present conspicuously different environments, and their occupants, who have long been in the process of adaptation, yield correspondingly different responses. A second paper dealing with some of these responses will follow this one.

Bull. Amer. Geogr. Soc., Vol. XLV. No. 2, 1913





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NEPAL
BHUTAN
TIBET
BENGAL
GUJARAT
CENTRAL PROVINCES
Calcutta
HAIDARABAD
ARABIAN SEA
Bay of Bengal
UPPER BURMA
LOWER BURMA
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CEYLON
Andaman Islands
Mergui Archipelago
Nicobar Islands
Laccadive Islands

Fig.1

VICTORIA ISLAND AND THE SURROUNDING SEAS*

By VILHJÁLMUR STEFÁNSSON

(Map facing p. 106.)

This is written as the result of a temptation successfully withstood in the spring of 1911. It seems so easy from where we were then to complete the survey of Victoria Island between the two points where the now famous expeditions of McClure and Amundsen had been forced to turn back, the one on the north coast, the other on the east, about 100 miles apart, as the crow flies—for there are crows, or ravens rather, and that is just the point. Where there are ravens there are also, in this section of the world, to be expected the caribou and seal, upon which the wolf and bear fatten and leave the raven a sufficient living from the abundance of their feasts. Where the raven lives on the superfluity of others, man—the most powerful and crafty of beasts of prey—can live well and go where he pleases, for the caribou, the seal, the wolf and the bear are equally his game, and even the parasitic raven himself forms a meal in an extremity. The well-equipped and able men before us had failed partly because they were civilized out of the habit of preying on the living things of the land and ice; they had turned back chiefly because they had a place to turn back to—a ship with supplies that awaited and expected their return. We were free of this latter handicap. We are everywhere homeless, or have a home anywhere, according to the point of view. Where summer caught us, there we would stay, and when good winter came again we would complete the unfinished work—if indeed it were unfinished, and if the winter found us in our health and strength.

When the temptation assailed me most strongly we (an Eskimo traveling companion and myself) were at the head of Prince Albert Sound, practically in the center of Victoria Island. We had already traveled 400 miles or so since we left, on March 22, our winter camp on Dease River, for we had made a considerable detour east

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* In view of Mr. Stefánsson's proposed expedition to the regions described (see *Bull.* for Dec. 1912, p. 917), the present article, written during his recent expedition under the auspices of the American Museum of Natural History and the Geological Survey of Canada and dated Parry Peninsula, July, 1911, is of particular interest as it also deals with the most feasible routes of access to a part of the unexplored territory.—Ed.

among the islands to visit the Eskimos of Coronation Gulf. We had "lived on the country" and it had fed us well. Our dogs were fat and willing; on level going we had to run to keep up with the seven of them pulling 700 pounds. It was the twelfth of May now; the sun shone bright the day and night through, for it was yet a good three weeks before the summer fogs would commence. The caribou were moving north by twos and threes and in herds of twenty or thirty; they were everywhere you looked and all going north with us. We had already accompanied them some 200 miles from the tree-line on the Coppermine River. They seemed to be moving about as fast as we were, but that would not have deterred us from resting a day had we wanted to: there were other caribou coming behind us, just as there were droves of them ahead of us that we should overtake if we traveled twice as fast as we were doing. And if the caribou were to vanish in air, the sea ice in May is dotted with seals that it takes no skill (but only a little patience) to crawl up to and shoot. Through the twelve days of May that were gone (and so it turned out to be for the rest of May and for June also) we did not usually shoot till near camp-time the meat that was to be our supper and breakfast, to avoid carrying its weight on our sled. It happened a few times that we found no food animal awaiting us just where we wanted to camp, but this generally proved a blessing in disguise, for we kept going on our intended course till we found something, and thus made a few more miles that day than we should else have done.

Our knowledge of the abundance of food and our nearness, at Prince Albert Sound, to either end of the unknown coast line make it clear that there was strong temptation to reach this unexplored territory. I was able, however, to remind myself with sufficient emphasis of the fact that we are engaged in ethnological work primarily. An ethnologist has no business in an uninhabited country. The Eskimos of Prince Albert Sound were able to tell us that the north coast of Victoria Island is not now inhabited. In their belief it never was inhabited. It was our business therefore to renounce our dreams, to buy a load of copper weapons, stone utensils and caribou skin clothing and to undertake the difficult task of hauling them four or five hundred miles (not as the crow flies) towards Cape Bathurst where they might have a chance of getting transportation by whaler to New York.

We thus had to turn away from the pleasant task of exploration because we were otherwise engaged. The following is therefore written with the idea of informing someone, who has more spare

time than we, of the things we have learned about Victoria Island and its surroundings. He will then be to a degree equipped for filling up, if he cares to, the hundred mile gap in our knowledge of one of the largest Arctic islands.

Along the south coast of Victoria Island the ice of Coronation Gulf is generally smooth and presents no serious difficulty to the winter traveler. In places there are a few pressure ridges along the shore, and farther out in the gulf there are occasional small areas of broken-up ice, chiefly in narrow passes between islands. There are in the southern portions of the gulf four times as many islands as charted [on British Admiralty Chart No. 2,118]; in its northwestern section some islands are omitted from the chart, while in one case one island is charted as four islands. No one crossing the gulf from south to north, or *vice versa,* should try to go by his chart, so far as the islands are concerned; one should depend on instruments and the sun only. In Dolphin and Union Strait the islands are more correctly placed and the chief ones appear on the chart, though not drawn there with any great realism. Clerk Island [69° 35′ N. and 118° 45′ W. on Chart No. 2,118], however, is either non-existent or else located far from where it is supposed to be.

From Cape Krusenstern and Lady Franklin Point to five or ten miles west of Lambert Island the ice is in places dangerous. The migrating caribou sometimes break through even in March and a sled or a man might easily do likewise. The reason for this condition is that strong tide currents rush back and forth through these narrows continually and keep the ice from becoming thick. On May 1, 1911, we found ourselves on ice that a jab of a pocket-knife would pierce anywhere. This was about five miles east of Lambert Island. There were before that (we came from the east) plenty of signs that the ice was thin but we thoughtlessly paid them no heed till I came near walking into a seal hole that must have been fifteen feet across. This was an emphatic danger signal, for a seal hole at that time of the year is large if it has the diameter of a salt barrel. We stopped, crept about on all fours and tested the ice around. There were from four to ten inches of snow, and where there were ten inches of snow there was practically no ice underneath; nowhere, I think, was the ice over two inches thick. It was midnight twilight, but my glasses defined both shores of the strait clearly enough as well as the end of Lambert Island, for which we were headed. We made up our minds that the mainland shore was

the nearest, as well as the least likely to be separated from us by a belt of strong current, and we made for it cautiously. Next day we crossed to Lambert Island following the trail of a band of twenty or so caribou. One who crosses the straits near the narrows at a time of the year when caribou are migrating does well to follow the trail of a band, even though the trail be crooked. "It is better to be safe than sorry"—one would not have a long time in which to be sorry if the ice over that salt water rapid should cave in under him. After the spring thaws set in, following a day-old caribou trail would not be a sufficient precaution, for where there is a strong current a few hours of warm weather or a small shower of rain often make a safe place dangerous. After the fifteenth of May at any rate a stranger to the locality should only in case of grave need cross the strait between Cape Krusenstern and ten miles west of Lambert Island. It is likely that after the first of June there would again be less fear of accident, for by that time the dangerous waters will have cleared off their film of ice. This is the only section of the Arctic Sea past which we have traveled in winter (between Icy Cape, Alaska, and Cape Barrow, Coronation Gulf) where currents keep ice dangerously thin, though such places exist in Arctic lakes wherever a considerable stream flows out of them. In large lakes such as Great Bear Lake, there is, on account of currents, dangerous ice or open water all months of the winter at certain places, generally between islands or between an island and the mainland. I have seen one such in front of the site of Fort Enterprise, near the mouth of the Dease.

In all probability the direction of the current in the straits everywhere changes if a stiff wind blows continuously for some time. That it is so fifty miles further west we have observed. At the narrows, however, the current flowed steadily towards the west for three days of variable light winds, and the natives said (on this I put little reliance) that it was usually so. I have, however, seen Mackenzie driftwood in Coronation Gulf and have heard of a whale with a brass whaling "iron" in it lodging on an island about 20 miles northeast of the mouth of the Coppermine River. That whale must have been "struck" in the Amundsen Gulf, or farther west, and currents and winds must have brought it east.

West of Lambert Island well toward Point Williams the ice of the straits has not been seen by us rough enough to delay a sled one mile in ten, but our observations of the western part of this section are confined to the spring of 1910. Simpson Bay we have twice seen; it is probable that the ice in it is always "smooth as a

floor." From Point Williams around the west end of the peninsula to and beyond Cape Baring the ice near shore was so rough that a loaded sled would not be likely to make one mile to its usual three. Crossing the strait southwest from "Cape" Kendall (which is a small tadpole-shaped island) to Croker River on the mainland coast we found the ice rough only for the first four or five miles from Victoria Island and the last five or six before reaching the mainland. The first spring thaw occurred at "Cape" Kendall on May 26, the day we left it. Four days later just west of the delta of Croker River (beyond the influence of the river itself as well as near the river) the warm weather had already made the tide cracks so wide that we had to ferry our sled over. The season is apparently a month earlier at Croker River (and everywhere west of it) than at "Cape" Kendall, which is not over forty miles (by the chart) farther north.

Except near its mouth the ice of Prince Albert Sound we found smooth. There are a few tide cracks at right angles (near shore at least) to the long axis of the sound, as I suppose tide cracks generally are in such symmetrical arms of the ocean. (We found them so in Darnley Bay, too, near shore, though they curve to seaward as they near the middle of that bay.) The Sound Eskimos told us that from Cape Wollaston to Cape Collinson the crossing between Victoria Island and Banks Island is never rough enough to seriously impede their sleds on their annual migrations (they winter at Nelson Head). The ocean to the north of Victoria Island—perhaps Glenelg Bay only?—they say is never very rough and is seldom, if ever, free of unbroken ice so far as they know. (This last statement inclines one to think they may be familiar with landlocked waters only—perhaps Glenelg Bay extends far to the east beyond the "farthest" of McClure's party. The Sound Eskimos reach the north coast by going overland north from the head of the Sound.) Prince Albert Sound is said to clear itself of ice every year.

Of ice conditions along the east coast we are informed by Lieut. Hansen of Amundsen's *Gjöa* Expedition. In general he found the ice smooth near land.

The shape of Victoria Island is such that anyone wishing to explore its northeast coast from a base on the mainland west of Cape Barrow or on the southern part of Banks Island, had best cross the island to Hansen's "farthest" on the east coast or to Wynniatt's "farthest" on the north coast, whichever suits best the special circumstances of the case. A party working from a ship in Victoria Island can, barring accidents, do anything that is to be done in the

island with no trouble. Apparently working from a base in Melville Island—the Mecca of a host of voyagers of the past—would be equally simple, and King William Island would form a desirable base also if one made an early start or else did not plan to return till the next autumn's ice gave one a bridge between the two islands. None of these methods of attack will be considered in the present paper.

Aside from the bases of operations above named, there are three farthest points from which the writer considers it feasible for one who is familiar with conditions to complete the survey of Victoria Island. These three are Fort Norman, on the Mackenzie River, Cape Bathurst on the Arctic mainland and Cape Kellett, in the southwestern part of Banks Island. Fort Norman can be reached any summer by Hudson's Bay Company transports in a month from Edmonton, Alberta; Cape Bathurst or Cape Kellett can be reached most summers by whaler in about six weeks from Port Clarence, Alaska. The three points named are therefore easy of access. No man who has never been in the Arctic before should, however, attempt to go to Victoria Island from so distant a base the first year—he will need at least a year of apprenticeship within retreating distance of a sure place of safety.

We shall proceed now to a description of the routes from the above-named three points of vantage to one edge or the other of the unknown area (cf. map, where routes are shown by broken lines and are numbered as below.)

(I) The Hudson's Bay Company's offices in Winnipeg, Manitoba, will furnish an estimate of the cost of taking an outfit to Fort Norman, as well as a statement of the degree of risk in transportation. Supplies bought at Fort Norman will necessarily be found expensive, and the stock on hand at the post is limited. The service of Indians at that point is cheap enough, but our experience goes to show that it is generally inefficient. Few Indians will dare to accompany one even far out on the Barren Grounds in winter and none are of service on the sea-ice. Their methods of travel are thoroughly unsuited to a woodless country. In the open they are poor hunters of caribou when compared with Alaskan Eskimos, and naturally they know nothing of sealing. Depending on fish-nets in winter is practicable only while one is in a country whose fishing places are known to at least one of one's companions. Indian clothing is better than Eskimo clothes for the wooded district around Great Bear Lake; it is, however (especially moccasins), unsuited to salt water ice.

A party working from Fort Norman would naturally move its base during the winter (if not during the preceding summer) to the mouth of Dease River on Great Bear Lake or to near the east end of the lake. In 1910-11 caribou were here everywhere plentiful; there are always some moose and the fishing in many of the small lakes is good in the fall, while in Great Bear Lake itself are well-known fishing places in which both nets and set hooks are productive at most seasons. Our own winter quarters were on the tree-line on an eastern branch of the upper Dease River. Practically we lived on caribou, though we caught a few fish "for variety's sake" in November and snared some ptarmigan in February. Our consumption for a party of five men and seven dogs was a little more than one caribou in two days; this has been our normal consumption at any season of the year when depending on caribou alone for food.

On March 22 we made our start for Coronation Gulf. We carried about one week's provisions of dried caribou meat; it would be easy enough for anyone who wished to to carry a month's supply of dried meat and dried caribou fat or tallow. We went up to Dismal Lake, east along it to its narrows, thence across country to the Coppermine River and down it to its mouth. As far north as Bloody Fall caribou were abundant. Beyond that point we saw none, probably on account of the enclosed character of the narrow river valley.

No great numbers of caribou seem to cross Coronation Gulf from a point 200 miles east of the Coppermine to east of Gray Bay. We saw none—only a few tracks—on a side trip we made east towards Gray Bay in early April. There were some bearded seals on the ice, however. Returning west from this excursion we found that about April 20 there were plenty of deer on the mainland coast about twenty miles east of the Coppermine. These deer had been there all winter—are usually there all winter, the Eskimos say. The last week of April, on our way from the Coppermine north-northeast to Simpson Bay we were seldom (in good weather) out of sight of north-moving bands of the animals. The first and second weeks of May it was the same in Dolphin and Union Strait while we alternately stopped a few days with Eskimos or traveled between encampments; it was the same also while we crossed overland from Simpson Bay to the head of Prince Albert Sound, and on the Sound itself while we were there—up to May 20. The animals were everywhere moving north and would, the people told us, stop only at the sea (Melville Sound). It need not be feared that this caribou

movement is confined to the western half of Victoria Island. The Umiñmûktok Eskimos seen on Great Bear Lake the summer of 1910 told us that they fill their sealskin blubber bags with deer marrow in spring as the herds move north across the Kent Peninsula; Hanbury found them there a few years ago and Collinson saw them crossing by thousands over half a century ago. The Ekalluktogmiut depend on this annual coming and wait for them on the Ekalluktok River that flows into the head of Albert Edward Bay. True, Hansen does not speak of seeing any on the east coast in May, but then he saw plenty of seals and killed some bears—and seals are even more dependable as a food supply than caribou. They are just as palatable and keep the dogs in better shape, besides furnishing fuel to cook their own meat.

There is said to be a practicable but not a good sled road north from the head of Prince Albert Sound to the sea (Glenelg Bay—Wynniatt's "farthest"). The Eskimos themselves use it occasionally, and their sleds are always heavily loaded and poorly supplied with dogs. A better way will be going east from the head of the sound up the Kagloryuak River which heads about midway between the sound and Albert Edward Bay. The middle of Victoria Island is said to be comparatively low, and one need not therefore cross from the head of the Kagloryuak to the head of the Ekalluktok and descend to Albert Edward Bay, as the Eskimos habitually do. One can take a northeasterly course for the coast, aiming to strike it a few miles south of Cape Nansen, Hansen's "farthest." In this way one is accompanied northward not only by the caribou but also by the poleward-marching summer. To be sure of ample snow on the ground one should leave Prince Albert Sound, whether northbound or eastbound, not later than May 10.

Having reached the east coast, one simply has to follow that coast to Glenelg Bay. Seals are sure to be there, while deer and bears are almost sure to be. Hunger need not be feared, and when you reach the "farthest" of Wynniatt you will already know more about the country than does the present writer and be able to choose your road home more easily than he. There will no doubt be an ice-bridge for you to cross to Banks Island. If you make no heavy geological or other collections you can, if you like, abandon your sled and return on land in summer to the south end of either Banks Island or Victoria Island if you have a ship to meet you, companions waiting for you, or any other reason for being in a hurry. Or you can spend the summer where the summer overtakes you and go where you want to when the ice has formed next fall. West of

Point Clifton on the mainland it is not safe to attempt crossing Dolphin and Union Strait after the first of June, unless you have the means of crossing open leads—a boat, or three or four seal floats of the Eskimo type (such as they use in whaling in Alaska and for other purposes farther east). It is probable that Prince of Wales Strait (Prince Patrick Strait) can be safely crossed somewhat later—on this head see McClure's and Collinson's accounts. Personally I should cross it where it widens into Melville Sound and follow the west coast of Banks Island south if my purpose were to meet a ship at Cape Kellett (within sight of which whalers cruise most years).

(II) If the start for Victoria Island be made from Cape Bathurst the journey can be commenced with the sled (or sleds) loaded with fairly condensed rations purchased from whalers at reasonable prices. Comparatively efficient traveling companions can be secured here (Alaskan Eskimos are better men, however, except that they cannot build snow houses) at wages of from $200 to $300 per year per man, the employer to furnish clothing, guns, etc. If bought of either whalers or natives the deerskins needed by one man in a year will come to something over $100 with $15 or $20 more for sealskins for waterboots, boot soles, etc., and for deer sinew for making clothes. In hiring Eskimos (for a long journey when "living on the country" is contemplated) it is of more importance to get good women than good men, for a husband will not travel farther or faster than his wife can go, and one's comfort in the Arctic and one's safety and success, too, depend on how good a seamstress one has to make and mend one's clothes. I have seen no "Arctic clothing" or waterboots made in Europe or America that are worth bringing to the Arctic. If you bring anything, bring wolfskins and short-haired light reindeer summer skins such as come from Siberia to San Francisco and Nome, but on no account have them made into garments by anyone but an Eskimo—if you do, you will eventually have them made over or else you will throw them away when you come to understand how to dress against cold and wet. "Hunting boots," rubber boots, fur caps, "Alaska" sleeping bags—none of these are worth bringing. Woolen socks and woolen underwear are better than the Eskimo substitute, for summer use, but for summer use only. Fur garments should be worn without "civilized" underwear if one is to have full benefit of their excellence.

For reaching Victoria Island our base was established in 1909 at Langton Bay, about ninety miles southeast of Cape Bathurst.

The start east was made on April 22, 1910, with provisions for two weeks. We found seals plentiful everywhere (bearded seals only —the season was too early for the harbor seal). There were a few polar bears and plenty of Barren Ground bears at Cape Lyon and again from Point Tinney to Inman River. Caribou are not plenty till east of Cape Bexley. The ice along the mainland shore was nearly everywhere rough in 1910; it was nearly everywhere smooth in 1911, so that with a load it was easier to make twenty-five miles per day the latter year than fifteen miles a day the former. The difference was probably partly due to a sprinkle of cakes of old ice in 1911 that extended from Cape Lyon to Croker River at least; in part the difference must have been due to the differing direction and violence of the autumn winds during the two seasons. In 1910 there was abundant evidence that the ice had been in motion all winter; there was a "landfloe" about two miles wide on the average from Cape Lyon to De Witt Clinton Point, from which place the edge of the floe extended north-eastward in the direction of Cape Baring. In 1911 there was no evidence of a similar condition. Not only were the open water lanes absent on the first day of June that had been so conspicuous at De Witt Clinton Point almost a month earlier the previous year, but the high perpendicular walls formed by floes grinding past each other were completely absent in 1911 not only at De Witt Clinton Point but everywhere west to Cape Lyon.

In the last week of May, 1911, we crossed Dolphin and Union Strait as above noted, between "Cape" Kendall and a point a little east of Point Tinney. Our observations in clear weather in 1910 and again in 1911 confirm those of Amundsen during the summer of 1905—there is no Clerk Island where the chart says it is and no one should count on making it a way-station in crossing the strait. An experienced man and a good judge of ice—and a good prophet as to what may lie beyond the horizon—might commence the crossing for Cape Baring so far west as Buchanan River and even De Witt Clinton Point, but in general it will be but conservative wisdom, especially if the sleds are heavy, not to take to the open sea much west of Croker River. I am not sure but I might myself prefer to follow the coast to Point Clifton and cross thence to "Cape" Kendall, bearing up, however, for Cape Baring so soon as that point is sighted, provided the ice seems fair ahead. From Cape Baring east there is no hindrance to rapid progress to the head of the Prince Albert Sound.

An alternative is to cross the straits to Point Williams instead of

to "Cape" Kendall, and follow the south coast of Victoria Island east to Forsyth Bay, thence crossing overland to the head of Prince Albert Sound. We crossed in May, 1911, from Clonston Bay (just east of Forsyth Bay) to the Sound near its head. Our course was about 310°, magnetic, and took us about ten miles to the westward of a conspicuous conical peak which bears 335°, magnetic, from the mouth of the Kogluktok River in Clonston Bay. This peak and the mountain range of which it is a westward outpost are without name, for they were first seen by us—we failed to ascertain the native name. It cannot, however, be mistaken—it is the one conspicuous landmark ahead so soon as you leave the sea at Clonston or Forsyth Bay. A course taking one past this peak from five to ten miles west of it gives a passable sledroad in the spring but probably not in the autumn for the ground is very stony and thick, and hard-packed snow makes the way feasible.

(III) Starting for Victoria Island from Cape Kellett one would expect rough ice from that point to and beyond Nelson Head. It is even probable (the Eskimos say they do not know) that certain years there is no ice-foot on which to sled around the Head. East of the Head one would expect to find Eskimos (Prince Albert Sound Eskimos) who could guide one to the proper place for a crossing to Victoria Island. If one were as late as April 15 one would probably find their trail only, but that would really be best of all. Their nigh thirty sleds make a beaten road, and their deserted snow-houses would save one from building a snowhouse of one's own to sleep in. Their trail would lead to Cape Wollaston and to Prince Albert Sound.

It may not be difficult (though I think it is, on account of the ruggedness of the land) to cross from Minto Inlet or some point north of it to Glenelg Bay for the purpose of making the survey of the coast in the reverse direction to that recommended above. Special conditions may make trying this wise, but one would have the disadvantage of traveling to meet the summer—one would experience (as we did going south in 1911) a sudden transition from snow and frost to heat, slush and rotten ice, full of holes and deep channels. One would either start only late in the season or else one would have to haul at least six weeks' rations on the sled, for caribou probably do not reach the north coast before nearly the end of May (there are caribou in numbers all winter in Banks Island; there are few or none in Victoria Island between the periods of the fall and spring migrations). Bearded seals appear first on top of the ice in Prince Albert Sound about May 10, and common seals

not till June. The season is probably considerably later on the north coast, and one who got there ahead of the season might find himself in a position to contribute yet another tragedy to the already too large number whose scene is the neighborhood of Victoria Island. We should be over such things now for we have profited by the loss of those who preceded us and are at home and acclimated where they were strangers, ignorant of the ways of the land. Yet it may happen to the best of us that we miscalculate or mismanage, as do the natives themselves, and then the catastrophe is sudden. Exploration work in the Arctic is like a tight-rope performance, safe as long as one keeps his head and his feet, and as long as the rope does not give or break.

A few further statements of facts of importance to the traveler may be worth appending.

Driftwood sufficient for camping purposes is found on the mainland coast everywhere so far east as Cape Krusenstern and Back Inlet. We have found none, and there probably is very little, between Cape Krusenstern and Back Inlet. On the south shore of Back Inlet there is a considerable quantity of drift willow from the Richardson River, and from Richardson River east to Gray Bay or beyond there is some wood in many places—most of it from the Coppermine, no doubt, but some apparently from the Mackenzie. Generally in Coronation Gulf wood is more abundant on the islands than on the mainland, and more abundant on the north and west sides than on the south and east sides of the islands. We have been told there is practically no driftwood on the south coast of Victoria Island between Mackenzie River and Lady Franklin Point. From Lady Franklin Point to the head of Simpson Bay (Victoria Island), there is considerable wood (small sticks only—much worn by the sea, but good fuel because cast up on a rocky beach), but from here west to Point Williams there is very little wood. From Point Williams to "Cape" Kendall there is some wood and from "Cape" Kendall around Cape Baring and into the head of Prince Albert Sound there is considerable. There is little along the north shore of the Sound but more along the coast to Minto Inlet and everywhere north well up the straits. On the east shore of Banks Island there is said to be less, until west of Cape Collinson. There is, however, said to be a much greater quantity of wood on the beach everywhere west of Nelson Head than east of it. It is seen therefore that the quantity of driftwood can be approximately foretold from a glance at the chart—the coasts whereon westerly and north-

westerly winds drive timber retain their hold on it; those upon which wood is lodged by southerly or easterly winds, lose the wood again, for the high tides always come with westerly winds—tides high enough to wash away wood from eastward facing beaches while lodging wood on the westward faces beyond the reach of any tide that accompanies an easterly wind.

The snowdrifts in Dolphin and Union Strait and Prince Albert Sound show that the strongest and most persistent winds in the latter part of winter at least are northwesterly; those next in strength are from a trifle east of southeast. Other winds leave few marks on the snow and their force and aggregate duration must be small.

There is open water all winter off Nelson Head and the place is much frequented by bears, upon which the Prince Albert Sound Eskimos (who live at the head of the Sound in winter) depend largely for food. There is open water also at most times not far off shore from Cape Baring, and some of the Sound Eskimos hunt there in winter. Other tribes depend chiefly on seal in winter and are to be found near the middle of Dolphin and Union Strait in a series of villages extending east from off Cape Bexley or Point Hope to Coronation Gulf. Finding people in the Gulf is more difficult—generally the best plan is to proceed east (or west) along some island chain near the middle of the gulf—not that the villages are to be expected on these islands, but the high cliffs furnish good vantage points from which to spy out the surroundings. In summer the entire southern half of Victoria Island may be considered peopled, though it is, of course, in places, far between the bands of roving caribou hunters.

In Darnley Bay bearded seals begin to come on top of the ice the first or second week in April. This holds for the coast about as far east as Inman River; on the southern portions of Coronation Gulf they appear only a little later. Near Point Williams the first were seen in 1910 by the natives on May 16, and about the same holds for the mouth of Prince Albert Sound, although we saw some at the head of the Sound on May 13, 1911. The common seal is about two to three weeks behind the bearded seal generally.

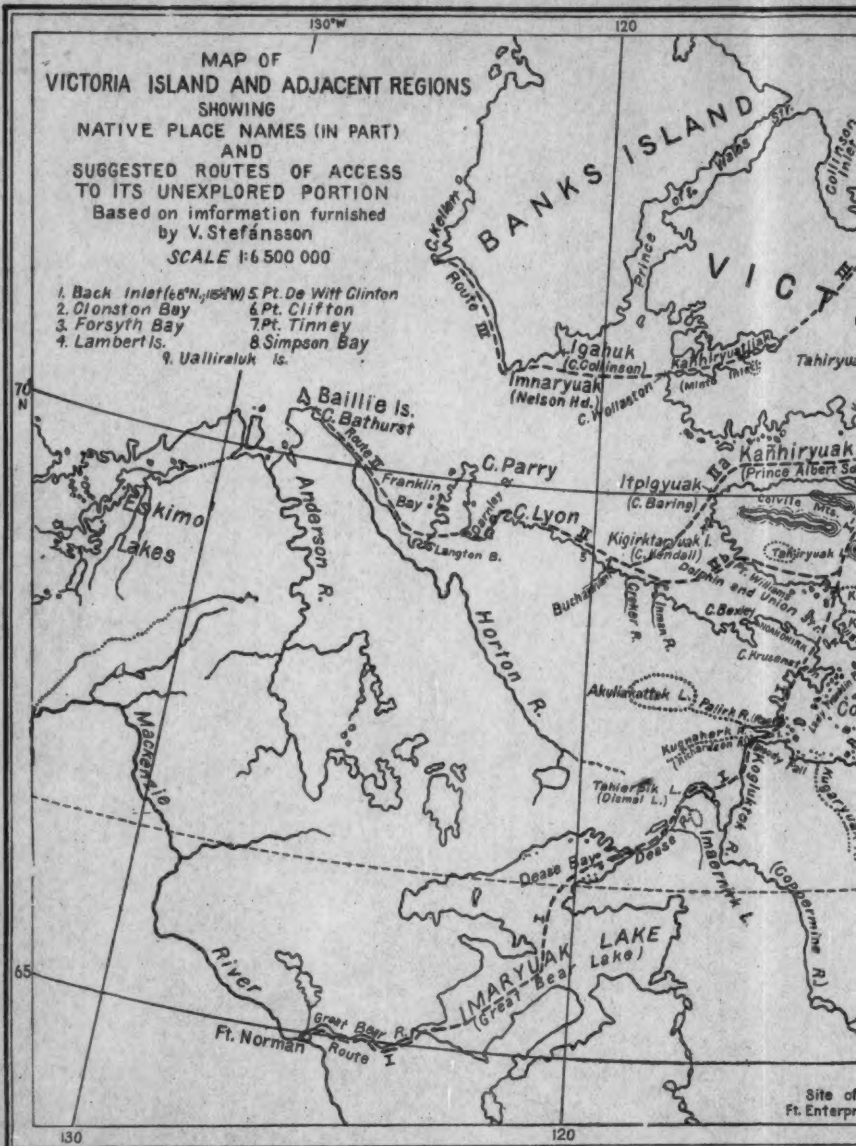
As to the seasons for seals the narrows of Dolphin and Union Strait about Lambert Island form an exception. It is said that no matter how cold it is, seals will lie on top of the ice there on a sunshiny day at any season—even just after the return of the sun in winter.

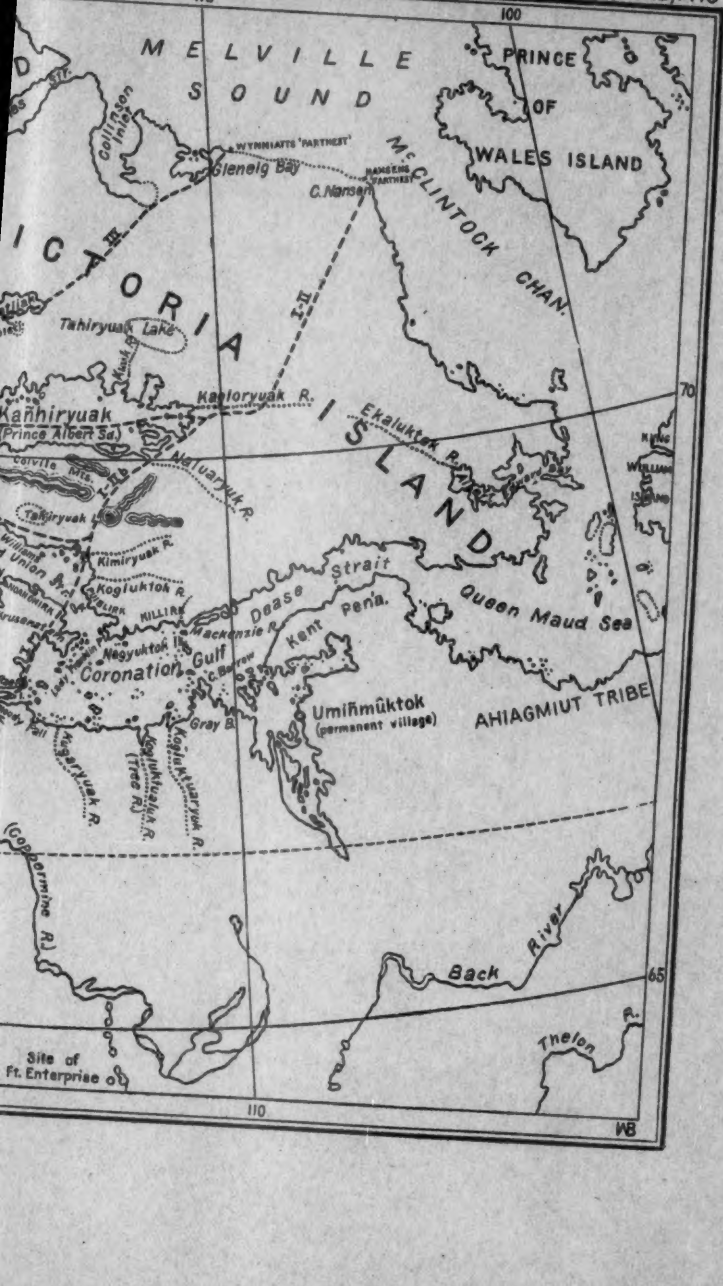
There probably are some musk-oxen between Great Bear Lake

and the Arctic Ocean west of the Coppermine River, but there cannot be many. Neither Eskimos nor Bear Lake Indians have gotten any in that region for some years. East of the Coppermine River on the seacoast they are found in considerable numbers on Tree River. There are none in Victoria Island south of Minto Inlet, but there are thought to be some in the uninhabited country northeast of the Inlet. There are considerable numbers in all parts of Banks Island.

Caribou are found all winter here and there in the entire mainland Barren Ground region from Cape Bathurst to Kent Peninsula and on Kent Peninsula itself. There are none in winter in the southern half of Victoria Island so far as the Eskimos know, and their opinions differ as to whether there probably are a few or none in the musk-ox district northeast of Minto Inlet. They are abundant in all parts of Banks Island, so far as the natives know—they never hunt them in winter but sometimes see them on the coast.

The caribou migrations across Coronation Gulf and Dolphin and Union Strait begin about the first of April and are practically over by the twentieth of May. In the fall the caribou start moving south past the east end of Prince Albert Sound before it freezes up, but the latter part of the migration in that region crosses the Sound after the ice forms. The Strait and the Gulf are crossed by the south moving bands so soon as the ice bears them. The first bands from the north reached the mainland shore just east of the Coppermine River on November 8, 1911. A heard of several tens of thousands passed our camp on Dease River the last week in October of the same year. We thought they were the west Victoria Island contingent, but of this I am now doubtful, for they were a different sort of animal from those with which we have since become familiar, in Victoria Island—larger, with black noses and black feet and a clear cut head generally, while the Victoria Island caribou are small, with a fuzzy-faced head reminding one of the donkey rather than of the horse,and with a muzzle and legs not nearly so dark as those of the larger species.


MAP OF
VICTORIA ISLAND AND ADJACENT REGIONS
SHOWING
NATIVE PLACE NAMES (IN PART)
AND
SUGGESTED ROUTES OF ACCESS
TO ITS UNEXPLORED PORTION
Based on imformation furnished
by V. Stefánsson
SCALE 1:6 500 000
1. Back Inlet
2. Clonston Bay
3. Forsyth Bay
4. Lambert Is.
5. Pt. De Witt Clinton
6. Pt. Clifton
7. Pt. Tinney
8. Simpson Bay
9. Uallirαluk Is.
130°W
120
70 N
65
130
BANKS ISLAND
VICT
Prince of Wales Str.
C. Kellett
Route III
Igahuk
(C. Collinson)
Imnaryuak
(Nelson Hd.)
C. Wollaston
Tahiryu
Kanhiryuak
(Prince Albert So
Itpigyuak
(C. Baring)
Colville Mts.
Kigirktaryuak I.
(C. Kendall)
Dolphin and Union Str.
C. Bexley
C. Krusenst
Baillie Is.
C. Bathurst
Route II
Franklin Bay
C. Parry
C. Lyon
Langton B.
Eskimo Lakes
Anderson R.
Horton R.
Buchanan
Croker R.
Inman R.
Akuliakattak L.
Kugaryuak
Tahierpik L.
(Dismal L.)
Kogluktok R.
Imaernik L.
(Coppermine R.)
Mackenzie
River
Dease Bay
Dease
IMARYUAK LAKE
(Great Bear Lake)
Great Bear R.
Ft. Norman
Route I
Site of
Ft. Enterpr


MELVILLE SOUND
PRINCE OF WALES ISLAND
McCLINTOCK CHAN.
Collinson Inlet
WYNNIATTS 'FARTHEST'
Glenelg Bay
NANSENS FARTHEST
C. Nansen
VICTORIA ISLAND
Tahiryuak Lake
Kagloryuak R.
Ekaluktok R.
Kañhiryuak
(Prince Albert Sd.)
Colville Mts.
Naluaryuk R.
Takiryuak
Kimiryuak R.
Kogluktok R.
KING WILLIAM ISLAND
Dease Strait
Queen Maud Sea
Kent Pen'a.
Mackenzie R.
Negyuktok Is.
Coronation Gulf
C. Barrow
Gray B.
Umiñmûktok
(permanent village)
AHIAGMIUT TRIBE
Kugaryuak R.
Kogluktualuk R.
(Tree R.)
Kogluktuaryuk R.
(Coppermine R.)
Back River
Thelon R.
Site of Ft. Enterprise
110
100
70
65
WB

THE SHIFTING OF CLIMATIC ZONES AS ILLUSTRATED IN MEXICO*

By ELLSWORTH HUNTINGTON

Let us turn now to a type of evidence which has not yet been discussed in print so far as I am aware. Hitherto practically all conclusions as to changes of climate have been based upon the phenomena of dry countries, and what has been said above in respect to Mexico is no exception. Let us now turn to moist regions. When I mentioned to Mr. Urbinas of the Geological Institute of Mexico my intention to visit some of the ruins in the extreme south of the country, he remarked that I would probably find them very interesting because they are located in places so damp and so densely forested that no one can live there now. Unfortunately he has not put his observations into print, but they deserve to be recorded. My own experience strongly confirmed the opinion of Mr. Urbinas. In the center of Yucatan at a distance of about a hundred miles each from the Gulf of Mexico on the west, the northern shore of Yucatan on the north and the Caribbean Sea on the east lies the narrow lake of Chichankanab. In this region, as I have explained in another article,† the tropical jungle of northern Yucatan gives place to genuine tropical forest. Instead of bushes and small trees which rarely exceed a height of twenty-five feet, the predominant vegetation is large trees fifty or sixty feet high. The air is always moist and warm so that whenever an old tree dies new vegetation sprouts with the utmost rapidity. The majority of the trees are hardwood species. Hence it is difficult to make clearings. If the trees are girdled in order to kill them off and allow of their being removed by burning, new vegetation grows up rank and lush before the old trees are dry enough to burn. The new vegetation is too moist to be burned, and so the natives are forced to cut once more. Even such a double cutting may not avail if rains are frequent, for new plants will sprout under such circumstances before the old ones are dry enough to burn. This makes the process of clearing the tropical forest extremely difficult. To this are added all the manifold disadvantages of innumerable malarial fevers, and of a damp, enervating warmth which tends continually to prevent instead of stimulate effort. In a word the difficulty of making clearings and carrying on cultivation in the tropical

* Concluded from the January *Bull.*, pp. 1–12. † *Bull.*, Vol. 44, 1912, pp. 807–809.

forest is so great that in the true forest as distinguished from the jungle no agricultural community appears at present to have succeeded in subduing more than a few merely temporary or exceptional areas.

The people living in the forest at the southern end of Lake Chichankanab at the present time are confined to a few widely scattered and barbarous Indians and a temporary population of *chicleros,* or men who come for a few months to gather the sap of the zapote tree for the purpose of converting it into chewing gum. Nevertheless, abundant ruins exist in this region. I discovered one of these a mile northeast of Esmeralda, the central camp of a chewing-gum concession which covers several thousand square miles but boasts of nothing more than four or five palm-thatched sheds at its headquarters. At the ruins I found abundant piles of stones indicating structures of various shapes and sizes from twenty feet square up to over a hundred in length by more than half as much in width. In one place some small pyramids appear to have been sacrificial, or at least ceremonial structures. Others were probably temples, and presumably the smaller ones were houses. In many cases the stones forming the outer portions of the walls were neatly smoothed and the corners of the buildings were carefully rounded, a task of no mean proportions for people who had no iron tools. The style of architecture is the same as that of the magnificent ruins of the northern, or jungle portion of Yucatan, steep arches with a capstone instead of a keystone, and with a massive filling of masonry between the consecutive arches. Evidently the people who built the magnificent temples of Kabah, Sayi, Uxmal, and Chichenitza spread their sway much beyond the present limits of civilized habitation, and penetrated into regions which now are covered with a thick tropical forest.

The most remarkable feature of the ruins is the evidence which they furnish of a comparatively dense population. At the Esmeralda site my guide took me along a winding path made by gum-gatherers on their way to find zapote trees. It was a mere trail, where the guide had to stop every few steps to hew down fresh palm saplings, or fallen trunks, or to cut long lianas hanging down from the trees. It was not made with any reference to ruins, and the undergrowth was so thick that we could almost never see more than twenty-five or at most fifty feet into the forest. Nevertheless, in the distance of a mile we counted over twenty-five heaps of ruins. If the forest were cleared off, undoubtedly one would see traces of many times as large a number of structures, hundreds in all probability. Moreover,

this is not the only place where evidences of a dense ancient population are found in the deep forest. My guide was evidently surprised that I should be so interested in mere mounds of stone, but he volunteered some valuable information. In the hunting trips which occupy a large portion of his time during the season when chewing-gum is not being gathered, he has traversed the surrounding forest for fifteen or twenty miles in almost every direction, and "everywhere," as he put it, has come across numerous mounds indicating ancient houses. Similar phenomena are found in certain other parts of Mexico and Central America. For instance, Palenque, in the Mexican state of Chiapas west of Yucatan, is noted as the site of some of the most magnificent ruins in America, ruins which are not only massive, but are beautifully and elaborately carved. They are located in what is described as the thickest kind of tropical forest. The size of the ruins and their large amount of sculpture indicate that the surrounding city must have been long inhabited by a dense population. Moreover, the people must have been highly industrious or they never could have accomplished such great results, especially when they had no iron tools to aid them, nothing but stone so far as has yet been determined.

In order to explain the occurrence of such evidences of high civilization in so unfavorable an environment one of two assumptions appears to be necessary; either the ancient people of America were far more capable than any tropical people of to-day and even than any European race which has yet learned to dwell in the tropics, or else the climate was different from that of the present, so that the tropical forest was replaced by tropical jungle. If the ancient inhabitants actually mastered the forest, they accomplished a task of extreme difficulty. Without iron tools they could scarcely clear large areas of hardwood trees, and if they merely girdled them, the difficulty of getting rid of the exuberant vegetation which would at once spring up before the girdled trees were ready to burn, would, as we have seen, be very great. Perhaps the old Yucatecos succeeded in this task, but if they did they accomplished something not now achieved by any modern tropical people, even though the modern races have the assistance of good steel tools. Moreover, they accomplished something which it is at least doubtful whether the races of Europe could at present accomplish if they were limited merely to stone implements.

The assumption of such wonderful ability on the part of the ancient Yucatecos seems unnecessary in view of the fact that there is

another equally good hypothesis which has much more support. We have already seen that various lines of evidence indicate that changes of climate in Mexico have taken place in the same way as farther north. The general effect of climatic changes seems to be to shift the peculiarities of one latitude into another latitude. Inasmuch as the chief change during the past 2,000 or 3,000 years, in the sub-tropical regions where the subject has been chiefly studied, appears to have been in the direction of aridity, the general shifting seems to have carried the conditions of more southerly regions into those farther north. This would seem to mean that at the beginning of the Christian era or earlier the zone of westerly storms, during the winter, at least, lay farther south than to-day and thereby prolonged the rainy season in the present sub-tropical zone, causing the period of precipitation to begin earlier and last longer than now, and thus making the country less arid than at present. The natural corollary of this would be that the sub-tropical zone of aridity was displaced southward. This might have no appreciable effect upon the sub-equatorial summer rains, but it would prevent rainfall during the winter, and would thus prolong the dry season. This would be to the detriment of forest trees which, so the botanists say, cannot endure any long period of aridity during the growing season. Such a change would cause a diminution of vegetation along the northern edge of the tropical zone of jungle and would cause jungle to take the place of genuine, dense forests still farther south. In Yucatan and other parts of southern Mexico or Central America the transition from jungle to forest is often quite sudden. For instance, in the region of Yucatan, it occurs within a distance of thirty or forty miles. If the line of transition were shoved southward fifty or a hundred miles it would cause jungle to prevail where the ruins are now found.

Such a change as has just been described would not merely explain the location of great ruins in regions now too densely forested to be habitable. It would also at least partially relieve us of the necessity of assuming that the ancient Yucatecos possessed a degree of energy and ability quite out of harmony with anything which now exists in regions so warm and debilitating as Yucatan. This would work through both direct and indirect stimulation. The indirect stimulation can be easily explained. Not only would the area of jungle be increased at the expense of the forests, thus enlarging the habitable area, but the regions where jungle now prevails might also become drier, and thus agriculture might become somewhat more

difficult than at present in places where it is now easy. If the people were at all energetic this would to a certain extent act as a stimulant. In order to get a living the inhabitants would be obliged to work harder and take more forethought than is now the case, although they would still find no great difficulty provided they worked with energy. Accordingly, energy, forethought and the qualities which advance civilization would be at a higher premium than now, and the portion of the populace which did not possess these qualities would tend to be eliminated.

The direct effects of a change of climate upon the Yucatecans cannot so easily be estimated. Before attempting to discuss them it will be well to examine more closely the possible mechanism of a shifting of the great climatic zones. This can best be understood by considering first what happens during our ordinary winters. Most of the rainfall of the United States is derived from cyclonic storms, that is from great areas of low pressure and in-blowing winds which may have a diameter of 500 or 1,000 miles, and which sweep across the country with a general easterly trend in obedience to the prevailing direction of the winds in temperate latitudes. The courses of these storms, so far as they are understood, are determined by the differences in pressure between the various more or less permanent areas of high or low barometer which center over oceans and lands in various latitudes and with varying degrees of intensity at different seasons. In general, storms move out from, or around areas of high pressure and are drawn toward those of low pressure. Anything which changes the location or intensity of the major pressure areas changes the course and intensity of storms. The North Atlantic Ocean, by reason of the high degree to which it is warmed by the Gulf Stream, is a most important area of permanent low pressure. To this is thought to be due in large measure the fact that the northern United States and Canada on the west and northwestern Europe on the east, together with the Atlantic Ocean between them, are the most stormy regions of the globe. In summer, when the continents become warm, and therefore are characterized by low pressure, the North Atlantic low area decreases in importance. The difference in pressure between land and sea is relatively slight, and the storms are correspondingly mild. They move more nearly from west to east than in winter, although, of course, with distinct curves, and their tracks, as a rule, are located well up toward the north. In winter, on the contrary, the continents cool off and become areas of pronounced high pressure, while the oceans are areas of low pressure.

At this time the difference in pressure between North America and the North Atlantic reaches a maximum, the barometric gradients are steep, and storms are correspondingly fierce. The courses of the storms under such conditions are more curved than in summer, and lie farther south. The center of the continent becomes so cold that an extensive area of permanent high pressure is formed. From this the winds blow outward. Thus the storms which would otherwise move more or less directly east from the Pacific to the Atlantic seem in many cases to be forced far to the south. Starting in California a storm may swing southeast into Arizona and Texas, and then move east and finally come up the Atlantic coast and swing off toward the low center of the North Atlantic. In its wake such a storm may send the thermometer down to twenty degrees Fahrenheit in southern Arizona and kill the peach blossoms which have opened too early. Farther south or east it may produce a "norther" with a temperature of 50° in Yucatan and kill the orange trees in Florida. The number of storms which follow such southerly courses varies greatly from year to year. Upon these variations the character of the winter largely depends. In 1911-12, for example, the northern parts of the United States had few storms and slight snowfall as a general rule during the middle of the winter, although this was compensated for toward spring. Farther south, however, storms which had gone far equatorward brought to Texas and northern Mexico more than the usual amount of rain, while Yucatan also had a comparative abundance of showers and of "northers." The conditions were by no means remarkable, but they serve to illustrate the fact that the variation in the tracks of the storms brings with it important results in the way of variations in rainfall and temperature. The winter of 1911-12 was characterized by a relatively pronounced and long continuing area of high pressure over the central part of North America, and therefore the storms for a season went far to the south.

If periods of more than a single year are examined, it appears that the general course of the storm track varies. Dunwoody investigated the storm tracks of the earth some years ago, and, so far as data were available, made a map* showing the average number of storm centers passing over each five degrees square of the northern hemisphere during the period of ten years from 1878 to 1887. His map shows that the number of storms is greatest in the region of the Great Lakes of North America, and is large throughout all of the

* Cf. Pls. 28 and 29, Atlas of Meteorology (Bartholomew's Physical Atlas, Vol. III).

northern United States, southern Canada, northwestern Europe, and Japan. In order to test this map Professor C. J. Kullmer of the University of Syracuse has reconstructed the portion for the United States for a period twenty-one years later. Unfortunately Kullmer's map has not yet been published, but he has kindly permitted me to use it in manuscript. It shows that in the later period the center of maximum storm frequency had moved a little to the south and west from its previous location. In other words, the average storm in 1883 or thereabouts followed a course slightly farther toward the south and west than did the average storm in the period centering around 1904. To put the matter in another way, between the times of the two maps the zone of prevailing westerly storms moved very slightly equatorward from its earlier position. I would not be understood as magnifying the slight differences between the two maps. Doubtless conditions may soon once more become the same as they were during the period covered by Dunwoody's map, and there is no reason to suppose that any great or permanent change has taken place. The important point, however, is that here we have direct evidence that the climatic zones of the world are at the present day subject to minor shiftings back and forth, and that these shiftings on a small scale produce results like those which our assumed larger and more prolonged shiftings appear to have produced upon a really important scale. Meteorologists almost universally recognize the fact of such minor shiftings, and it is valuable to have the matter definitely recorded in two maps which can readily be compared. To sum up the matter briefly, in the irregular little cycles which cause the climate, or weather, of one year to differ from that of the next, the course of the storm tracks varies, moist periods in sub-tropical regions being characterized by southerly tracks. In longer periods, such as the 21 years between Dunwoody's and Kullmer's maps, the same sort of variation is seen on a larger scale. Therefore it seems reasonable to suppose that in still longer and more important periods the same thing occurs with a correspondingly increased intensity.

In discussing the changes of climate which appear to have taken place in Asia, I have elsewhere stated that they appear to be of the same nature as those of the glacial period, the only difference being one of degree, not kind. In the western hemisphere the evidence points to the same conclusion. Hence it will be of value to consider some of the latest results of researches upon the conditions of glaciation in polar regions at the present time. To meteorologists and

glaciologists one of the surprising results of recent explorations of Greenland and the Antarctic continent has been the discovery that these ice-capped areas are regions of high rather than of low pressure. Previously it had been supposed that the general low pressure, which appears to become more and more pronounced as one goes poleward, prevails over all lands where continental ice-sheets now exist. It was thought that only in this way could sufficient precipitation be obtained to support the great ice-fields and to supply ice for the thousand of bergs and floes which wreck our ships. As soon as explorers began to study the winds of ice-capped regions with any care, however, they discovered that the prevailing movement of the air is strongly outward. At times it may be reversed, but not for long. This means, of course, that high barometric pressure prevails in the interior and is busily forcing the air outward except at times when some general disturbance upsets the normal conditions. This is what would naturally be expected, since vast areas of snow are bound to be extremely cold and hence are likely to induce high barometric pressure. Hitherto, however, it has generally been supposed that such almost continuous high pressure could not characterize such regions because there would be no way of obtaining precipitation. It remained for Professor Wm. H. Hobbs in his valuable book on glaciers to focus attention upon this point. He has attempted to explain the matter by an ingenious hypothesis to the effect that under the peculiar conditions of glaciation and of the newly discovered inversion of atmospheric temperature at high levels, fine crystals of snow can be deposited even when the barometer is high and the air clear. Whether his theory is sound or not I do not attempt to determine, but it has much to be said in its favor. Its chief value, however, lies in its emphasis of the fact that regions of continental glaciation appear to be areas of high pressure. This being so, an increase in the area of continental glaciation would apparently be conditional upon an increase in the area of permanent high pressure. At the height of a glacial period high pressure, according to this theory, would prevail throughout the year over a large part of the northern half of North America. If other conditions remained so far as possible the same as at present, the barometric gradients from the great glaciated areas of high pressure to the low areas of the oceans and of equatorial regions would be far steeper than now. Hence the winds would acquire great strength. Storms would doubtless be even more numerous than now, and they would follow more southerly courses. Forced far to the south by

the great continental high areas both in North America and in northwestern Europe they would swing down into southern Mexico or the Sahara Desert, as the case might be, and the climates of those southerly regions would partake of the unstable character which today is so characteristic of the parts of North America and Europe where the world's most progressive races dwell.

If we are right in supposing that the climatic changes of which we seem to have found evidence during historic times are of the same nature as those of the glacial period, we can readily see how in the days of Yucatan's glory the storminess of the United States may to a certain extent have been shifted to the south. Under such conditions winter storms may have been more frequent and severe than is now the case; the winds may have blown more forcibly; and the minimum temperature may have fallen as low as freezing instead of only to 50°. The winter rainfall may also have been slightly larger than now in the drier parts of Yucatan, although not necessarily in the regions farther south where now the sub-equatorial forest prevails. There, in fact, as we have already seen, the chances are that conditions would be much drier than now, for the slight precipitation due to the southern edge of cyclonic westerly storms would by no means compensate for the pushing southward of the present type of winter rain. In summer, on the other hand, if a permanent and extensive high pressure area was located in the northeast of the continent, or extended out from Greenland, the sub-equatorial zone of rains may not have been able to shift so far to the north as at present. Hence less rain may have fallen, and the country may have been distinctly drier than at present, although the northern part of the country may have had a few winter showers which it does not now enjoy.

At best the theory here presented is only an approximation to the truth; at worst it is a suggestion which may lead to the evolution of a more satisfactory hypothesis. Already the careful reader has probably detected a possible inconsistency in the conclusions stated above. As here presented the theory of the shifting of climatic zones assumes that a given change of climate will produce opposite effects on the northern border of the sub-tropical zone of aridity as compared with the southern border. If this is so, it might be expected that the fluctuations of the lakes around Mexico City would indicate conditions exactly the reverse of those recorded in the growth of the sequoias in California. This, however, is only partially the case. The importance of this apparent discrepancy cannot

yet be determined. It may mean merely that although the major climatic variations occur in accordance with our theory, minor fluctuations occur independently on the northern and southern sides of the sub-tropical zone. It may mean also that the interpretation here presented is erroneous. Possibly an increase in the high pressure area at the north and a consequent increase in the velocity of the winds would not only cause the cyclonic storms of the temperate zone to move farther south in winter than is now the case, but would also bring the equatorial rains farther north in summer. If this is so some of our conclusions as to Yucatan must be modified. The jungle of the past instead of having been more extensive than that of the present would have been less extensive, and the forest greater. Therefore the difficulties of the ancient Yucatecos would have been increased. In that case it becomes more difficult than ever to explain how a tropical people was able to accomplish such wonderful results. Yet it is possible that the summer rain might migrate farther north than at present and yet not cause the forests to increase. If the rainy period were shorter than at present because of the pushing southward of the climatic zones, the forests would suffer even though the summer rains did migrate farther north.

So far as the possible stimulus of greater climatic changeability is concerned, however, our conclusions need not necessarily be modified. All that we can now do is to present the problem and to attempt to explain it by a theory consistent with the facts. With our present scanty knowledge of the exact effects of varying conditions of temperature, pressure, humidity and the like upon man's vital processes, it would be rash to say that the difference between the Yucatan of the past and that of the present is due to climatic causes more than to anything else. This much, however, can be safely said: if the shifting of zones has taken place in any such way as we have inferred, the peculiar contrast between the wonderfully progressive people who once dwelt in Yucatan and the indolent present inhabitants is much less inexplicable than is now the case.

ON SOME CLIMATIC CHANGES RECORDED IN NEW YORK CITY

(STUDIES ON CLIMATE AND CROPS: 5)*

By HENRYK ARCTOWSKI

The meteorological observations made at the New York Central Park Observatory (Old State Arsenal, near Fifth Avenue, at 64th Street) under the direction of Dr. Daniel Draper extend from 1868 to July, 1911. This long series of meteorological records may be considered as being perfectly homogeneous. In the present paper I intend to study some of the results of Dr. Draper's observations, in continuation of my former investigation of the remarkable variation in sunshine duration in New York City.† The recorded figures for the years 1877-1911 are given in Table I.

TABLE I.

Actual Hours of Sunshine, Monthly and Annual, Recorded at the Central Park Observatory, New York, N. Y., from 1877 to 1911.

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	YEAR
1877	163	194	283	269	339	374	345	348	307	213	166	152	3153
1878	142	143	227	239	319	322	347	317	283	270	171	156	2936
1879	176	195	245	269	355	354	376	303	275	250	179	124	3101
1880	161	190	185	209	379	336	330	294	261	225	158	114	2842
1881	156	178	150	277	298	300	341	343	267	238	164	150	2862
1882	126	183	217	226	252	314	327	280	191	177	164	155	2612
1883	111	118	249	218	308	303	338	325	237	171	146	142	2666
1884	120	105	160	209	270	292	241	204	268	206	158	100	2333
1885	143	156	217	240	228	304	311	247	234	159	121	131	2491
1886	119	144	168	202	219	244	298	287	182	175	160	121	2319
1887	122	120	202	209	275	277	258	279	213	175	162	113	2399
1888	136	161	187	237	154	318	298	272	178	158	135	171	2405
1889	149	152	171	199	271	275	228	287	164	140	114	145	2295
1890	122	107	158	246	246	256	262	227	182	131	156	136	2229
1891	108	128	171	236	258	306	249	200	234	183	130	157	2360
1892	121	120	191	225	233	246	291	254	234	205	105	123	2348
1893	133	111	176	194	251	255	313	276	239	190	178	127	2443
1894	114	121	209	199	222	269	291	254	198	167	147	141	2332
1895	134	163	194	194	266	253	288	296	253	235	120	122	2518
1896	144	140	197	227	361	244	270	295	211	154	114	163	2520
1897	132	139	175	261	278	268	235	244	248	208	121	105	2414
1898	121	138	160	182	182	319	246	267	248	179	128	132	2302
1899	156	139	152	281	266	318	280	256	244	187	172	171	2622
1900	159	160	220	239	290	320	334	288	228	156	134	175	2703
1901	155	215	178	141	224	363	263	257	242	249	153	149	2589
1902	156	163	199	201	268	310	262	303	181	188	155	144	2530
1903	136	168	191	244	323	138	335	215	251	186	188	154	2529
1904	138	189	181	245	295	308	311	315	236	251	169	107	2745
1905	151	184	216	239	296	297	323	273	231	226	191	117	2744
1906	111	202	193	279	308	329	307	226	251	159	175	103	2643
1907	99	170	219	207	248	308	343	315	181	245	113	126	2574
1908	157	174	200	255	253	372	353	295	248	214	149	126	2796
1909	135	147	206	195	279	316	378	306	242	224	163	161	2752
1910	155	171	255	269	275	282	381	294	255	228	127	145	2837
1911	127	147	237	247	321	288	328	262	242	178	179	140	2696

* For previous papers in this series see *Bull.*, Vol. 42, 1910, pp. 270–282 and 480–495, Vol. 44, 1912, pp. 598–606 and 745–760.

† Variations de longue durée de divers phénomènes atmosphériques. *Bull. Soc. belge d'Astron.*, 1907.

These figures show a steady decrease in the yearly numbers of hours of sunshine, from the beginning of the series of observations until 1890, followed by a more or less progressive increase. The range of the variation may be best appreciated from the fact that the figure 3153 for 1877 is equivalent to a mean daily duration of eight hours and thirty-five minutes, while the figure 2229 for the year 1890, corresponds to a mean daily duration of six hours and six minutes. It is obvious that the observed difference of two hours and a half of sunshine a day must have had many practical consequences, and undoubtedly it would be possible to corroborate this by statistical data from hygienic and economic records.*

The real significance of the variations of annual data can be studied advantageously by utilizing consecutive or overlapping means. By determining all the averages of twelve consecutive monthly means one avoids the purely conventional mode of counting the year from January to December, and the succession of values then shows how an exceptionally low or an exceptionally high figure is generally only the product of a continuous tendency of decrease or increase. I have computed overlapping annual means from the monthly records of sunshine duration, atmospheric pressure and temperature. Figure 1 expresses these figures graphically. The object of this paper is to examine some of the details of these curves.

The curve of consecutive totals of sunshine shows that the decrease from the value of 1877 to the minimum of the year 1890 is marked by most characteristic ups and downs. The crests and the depressions of the ascending part of the curve, from 1890 to 1910, are less characteristic. The descent from each crest (towards the right) is generally steeper than the ascent.

After 1886 we notice groups of crests. For example, between 1890 and 1897 we see three ups and downs forming a group. Another group of two crests characterizes the variation of the figures between 1886 and 1890. The same may be said of the crests after 1898. In this case there are six and not three or four. It is difficult, therefore, to ascertain the mean duration of the crests.

* In the case of the observations of Pavlovsk (Notice sur les variations de longue durée des amplitudes moyennes de la marche diurne de la température en Russie, *Bull. Soc. belge d'Astron.*, 1908), I have shown that changes in the mean daily variations of temperature correspond with changes of the annual values of sunshine duration. This fact is not verified by the Central Park observations. The differences of the annual mean temperatures recorded at 7 A.M. and 2 P.M. do not always follow the oscillations of the sunshine records and, moreover, from 1891 to 1908 the values of the daily variation (expressed by these differences) decrease from 9.1° to 6.5° F., which is precisely the contrary of what was to be expected.

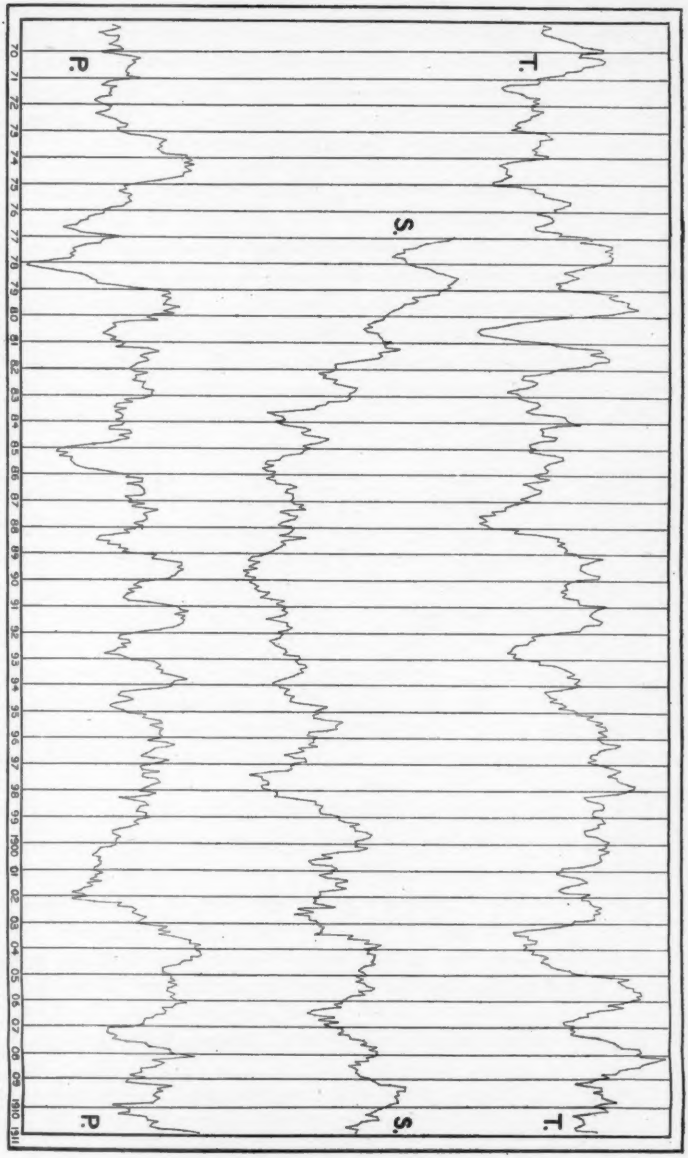


FIG. 1—Diagram of the Consecutive Totals Expressing the Variations in Temperature (T), Sunshine Duration (S) and Atmospheric Pressure (P) Recorded at the Central Park Observatory, New York, N. Y., from 1869 to 1911.

If we admit the existence of fifteen depressions we may say that they occur from sixteen to thirty-eight months apart and that the mean duration of the crests is twenty-five months.*

The amplitude of the oscillations is another feature which may be taken into consideration. The diagram gives the impression that the crests decrease up to 1892 and increase subsequently.

Considering the curves of consecutive totals of atmospheric pressure and temperature in the same way we can distinguish similar ups and downs.† From 1872 until 1910 I count eighteen depressions on the barometric curve, the intervals between which vary from eleven to fifty-four months. The mean of the intervals between the depressions is twenty-five months, which is exactly the same figure as in the case of sunshine duration. On the curve of consecutive temperatures I distinguish nineteen depressions between 1869 and 1911, the intervals varying from eighteen to forty-two months. And, in this case again, the mean duration is twenty-five months. This mean period of twenty-five months justifies the conclusion that the oscillations which we observe on these curves are primarily due to the same cause, most probably a cosmical cause.

It is, therefore, interesting to notice the lack of correspondence between the ups and downs of these curves.

Comparing the curve of sunshine duration with the curve of temperature we see that generally these two curves are inverted: that smaller durations of sunshine correspond to higher values of temperature. But in certain cases the depressions occur at the same time as the crests of temperature, and in other cases they are retarded, and sometimes it is impossible to discern any correspondence at all.

Comparing now the curve of atmospheric pressure with the temperature curve we notice a striking similarity from 1889 until 1897, showing that, exceptionally, for a short period of years, the consecutive means of pressure and temperature follow the same variations, just as it may be the case for equatorial regions. In New York, however, the annual mean of temperature is but exceptionally a function of the annual mean of atmospheric pressure.

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* The researches of H. Helm Clayton, published in the *Amer. Meteorol. Journ.* (Vol. I, 1884-85, p. 130 *et seq* and p. 528 *et seq.*) were not known to me when I wrote this paper. Clayton not only discovered the twenty-five month period but has drawn departure maps. In the future I will naturally refer to Clayton's researches and give, in one of these papers, some account of what he found.

† In Tables II and IV, I produce the observed means. These tables can serve to verify the values of overlapping totals utilized to trace the curves.

TABLE II.

MEAN MONTHLY AND ANNUAL ATMOSPHERIC PRESSURE IN INCHES RECORDED AT THE CENTRAL PARK OBSERVATORY, NEW YORK, N. Y., FROM 1869 TO 1911.

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	YEAR
1869..	29.941	29.881	29.956	29.813	29.723	29.890	29.887	29.955	30.063	29.874	29.889	30.068	29.909
1870..	30.005	29.812	29.834	29.864	29.857	29.881	29.875	29.911	30.035	29.990	29.908	29.869	29.931
1871..	30.117	29.969	29.910	29.797	29.879	29.846	29.854	29.902	30.021	30.012	29.901	29.978	29.935
1872..	29.912	29.872	29.883	29.914	29.836	29.842	29.842	29.915	29.922	29.970	29.937	30.010	29.904
1873..	29.981	29.866	29.848	29.821	29.906	29.887	29.907	29.964	29.983	29.956	29.853	30.037	29.917
1874..	30.060	30.059	29.887	29.938	29.863	29.866	29.931	29.917	29.999	29.998	30.064	30.045	29.969
1875..	30.105	29.981	29.976	29.850	29.879	29.914	29.856	29.924	29.916	29.873	29.953	29.908	29.928
1876..	30.017	30.008	29.916	29.881	29.945	29.891	29.859	29.948	29.863	29.856	29.825	29.864	29.905
1877..	30.013	29.922	29.864	29.869	29.874	29.883	29.830	29.827	29.958	29.923	30.006	30.036	29.916
1878..	29.936	29.843	29.847	29.726	29.818	29.828	29.848	29.778	29.993	29.898	29.828	29.852	29.850
1879..	29.899	29.941	29.988	29.803	29.993	29.885	29.885	29.829	29.996	30.032	29.999	30.048	29.941
1880..	30.049	29.960	29.913	29.884	29.952	29.879	29.876	29.958	29.925	29.969	30.083	29.854	29.942
1881..	29.999	30.054	29.620	29.778	29.975	29.832	29.846	29.913	29.997	30.023	30.029	29.993	29.921
1882..	29.977	29.980	29.926	29.871	29.876	29.766	29.893	29.933	29.939	29.967	30.008	29.947	29.923
1883..	30.032	30.106	29.807	29.875	29.846	29.883	29.870	29.928	29.968	30.035	29.996	29.945	29.941
1884..	29.965	29.935	29.880	29.715	29.835	29.991	29.761	29.966	30.009	30.023	29.943	30.020	29.920
1885..	29.943	29.818	29.888	29.899	29.846	29.874	29.855	29.866	29.942	29.882	29.782	29.857	29.871
1886..	29.913	29.923	29.806	30.016	29.829	29.896	29.873	29.894	30.031	30.052	29.873	29.979	29.923
1887..	29.893	30.071	29.803	29.870	29.953	29.919	29.894	29.891	30.004	29.908	29.919	29.969	29.924
1888..	30.026	29.960	29.915	29.996	29.901	29.841	29.923	29.897	29.962	29.837	29.988	29.910	29.929
1889..	29.905	30.008	29.777	29.868	29.880	29.951	29.915	30.000	29.949	29.921	29.954	30.027	29.929
1890..	30.077	29.985	29.904	29.997	29.883	29.919	29.965	29.946	30.037	29.781	29.927	29.919	29.945
1891..	29.903	29.952	29.973	29.877	29.926	29.866	29.946	29.930	30.075	29.970	30.061	30.057	29.961
1892..	29.917	30.026	29.850	29.958	29.895	29.889	29.941	29.891	30.032	29.843	29.914	29.927	29.924
1893..	29.831	30.005	29.955	29.968	29.816	29.937	29.857	29.869	29.928	29.988	29.977	29.979	29.925
1894..	30.036	30.023	29.993	29.931	29.878	29.917	29.937	29.946	30.007	29.873	29.953	29.994	29.957
1895..	29.910	29.803	29.858	29.908	29.951	29.981	29.865	29.864	29.946	29.907	30.042	30.032	29.922
1896..	30.078	29.787	29.871	30.044	29.962	29.879	29.916	29.930	29.919	29.900	30.057	30.023	29.947
1897..	29.972	29.948	29.943	29.972	29.851	29.848	29.879	29.887	30.029	30.034	29.960	29.955	29.939
1898..	29.884	29.957	30.102	29.827	29.847	29.897	29.959	29.915	29.963	29.999	29.923	29.912	29.932
1899..	30.026	29.898	29.832	29.961	29.938	29.935	29.880	29.903	29.950	30.090	29.916	29.946	29.939
1900..	29.920	29.867	29.863	29.883	29.853	29.863	29.885	29.940	29.978	30.061	29.908	29.939	29.913
1901..	29.871	29.784	29.835	29.868	29.820	29.934	29.878	29.956	29.972	30.039	29.867	29.938	29.896
1902..	29.955	29.713	29.845	29.816	29.917	29.813	29.917	29.870	29.960	29.953	29.972	29.954	29.890
1903..	29.830	29.915	30.102	29.779	30.049	29.855	29.874	29.921	30.042	29.924	29.942	29.918	29.928
1904..	29.983	30.041	30.025	29.897	29.934	29.982	29.956	30.002	30.044	30.014	29.888	29.933	29.975
1905..	30.008	30.051	30.036	29.802	29.930	29.906	29.925	29.921	29.971	30.017	29.924	29.972	29.955
1906..	30.013	30.081	29.976	29.880	29.893	29.866	29.912	29.951	30.013	29.971	29.950	29.996	29.958
1907..	30.103	29.973	29.968	29.791	29.912	29.867	29.821	29.932	29.937	29.962	29.943	29.901	29.925
1908..	29.876	29.968	30.013	29.850	29.873	29.985	29.999	29.960	30.037	30.062	29.945	29.959	29.959
1909..	30.031	29.849	29.734	29.972	29.855	29.912	29.872	29.952	30.036	29.968	30.073	29.813	29.922
1910..	30.002	30.006	29.989	29.855	29.893	29.859	29.852	30.004	30.019	29.928	29.709	29.927	29.920
1911..	30.037	29.999	29.897	30.041	29.967	29.870	29.936	29.969	29.995	30.009	29.942	30.062	29.977

I will now examine the barometric data more in detail. On Table II I reproduce the monthly means of atmospheric pressure recorded from 1869 until 1911.

By computing for each month the differences between the highest and lowest observed mean we obtain the following figures:

January......	0.287	May	0.326	September....	0.200
February......	.393	June..........	.178	October.......	.309
March........	.482	July..........	.238	November	.374
April.........	.329	August.......	.226	December	.255

These figures express approximately in thousandths of an inch the range of possible variation. I say approximately because for a longer series of observations some or all of these figures would be slightly increased. But such as they are, they lead to the following deductions: The summer months and especially the months of June

and September have the most constant means; the months of December and January form a secondary minimum, whereas the highest ranges of possible variation occur in March and November. In New York it is therefore at the end of autumn and at the end of winter that the greatest differences may occur: the barometric conditions of these months are the least likely to be constant from one year to another.

I have also computed the means of atmospheric pressure for the four decades from 1871 to 1910. These are given in Table III in

TABLE III.

DECADE	INCHES	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1871–1880.	29.921	+.088	+.021	—.008	—.073	—.027	—.049	—.052	—.025	+.037	+.028	+.024	+.042
1881–1890.	29.923	+.050	+.061	—.090	—.035	—:041	—.036	—.044	.000	+.061	+.020	+.021	+.034
1891–1900.	29.936	+.012	—.009	—.011	—.003	—.044	—.035	—.030	—.029	+.047	+.030	+.035	+.040
1901–1910.	29.934	+.033	+.004	+.017	—.083	—.026	—.026	—.034	+.013	+.069	+.050	—.013	—.003

the form of monthly means expressed in departures from the yearly means, for each of the four decades from 1871 to 1910. The differences between these figures demonstrate the non-existence of a "normal" yearly variation. For the months of January, February and March, for example, the range of the departures is, respectively, .076, .070 and .107. Therefore, for these months the means of the forty years would be purely illusory "normal" values.

This cannot be said of the summer and autumn months, and the September maximum, in particular, may be considered as being perfectly characteristic.* This is also true if we take individual years (cf. Table II). Indeed, the highest monthly value falls thirteen times in September, twelve in August, and nine in November. The location of the minimum of the yearly variation is less well defined. April has most frequently the lowest monthly mean of the year (eleven times), then comes March (seven times), then May (six times). But the minimum occurs also as early as February (five times) or as late as October and November. This fact leads to the conclusion that, in the case of New York, the annual variation of atmospheric pressure must be very greatly affected by these more or less irregular disturbances which are graphically demonstrated on the curve of consecutive means.

*In a paper on the yearly variation of the distribution of atmospheric pressure in North America, to be published shortly, the cause of the appearance of the September maximum will be easily explained by comparing the maps I have drawn.

It is easy to be convinced that this is really the case by tracing diagrams of monthly means for typical examples of crests and depressions of the curve of consecutive means.

In my first paper on climate and crops I have already shown how curves of consecutive means may be applied to the study of the maps of annual departures. Evidently the oscillations of the curve of New York must correspond to waves, which, on the map, are expressed in form of hyper- and hypo-pressure areas. These waves displace themselves. It is therefore interesting to notice that, for New York, these abnormal changes may equal or may even be more important than the seasonal oscillations.

In the following table (Table IV) I reproduce the monthly and annual means of temperature:

TABLE IV.

MEAN MONTHLY AND ANNUAL TEMPERATURE (F.) RECORDED AT THE CENTRAL PARK OBSERVATORY, NEW YORK, N. Y., FROM 1869 TO 1911.

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	YEAR
1869......	35.07	34.47	34.77	49.24	57.70	69.28	72.82	71.75	65.60	50.89	40.34	34.71	51.45
1870......	37.49	31.27	34.09	50.70	60.86	72.85	76.55	75.25	67.64	56.71	45.49	34.13	53.58
1871......	28.30	30.20	44.16	52.02	60.40	68.21	72.32	73.64	60.82	55.60	38.82	29.15	51.12
1872......	28.78	29.85	30.53	49.35	61.48	71.22	77.47	75.55	66.44	53.21	40.99	26.70	51.02
1873......	28.58	29.53	35.71	46.69	58.80	70.33	75.43	72.00	65.38	55.79	37.01	36.52	50.08
1874......	34.20	31.26	37.10	41.11	58.81	70.10	73.94	70.25	67.02	55.12	43.36	33.84	51.36
1875......	23.84	25.17	34.10	43.08	60.11	69.19	74.04	72.93	63.95	53.55	39.27	33.86	49.45
1876......	36.55	31.79	34.36	47.04	60.22	73.53	79.44	75.15	63.74	50.58	45.19	24.94	51.87
1877......	27.73	36.99	35.84	47.72	59.64	70.20	75.04	75.37	66.93	58.83	44.54	37.36	52.76
1878......	30.26	32.20	44.14	53.27	59.43	67.71	77.84	74.20	68.30	58.69	43.76	32.77	53.52
1879......	26.90	27.95	39.95	48.42	63.33	70.24	75.03	72.03	63.31	60.33	43.41	37.32	52.35
1880......	39.62	37.20	36.47	50.02	67.91	73.14	74.90	72.65	67.10	53.62	38.72	26.53	53.22
1881......	24.71	28.69	26.74	46.30	62.29	65.17	73.69	73.82	73.44	58.84	45.16	39.44	52.37
1882......	28.77	35.21	40.40	47.65	56.56	71.82	75.79	73.42	67.14	57.08	39.19	30.59	51.97
1883......	25.18	30.24	32.72	47.10	61.13	73.98	74.46	70.40	62.59	52.20	43.74	31.98	50.48
1884......	24.69	34.01	37.67	48.13	59.82	71.25	71.93	73.71	72.03	57.70	44.30	33.64	52.42
1885......	29.41	22.74	30.62	49.39	59.86	70.96	78.49	72.35	64.38	54.11	44.93	35.70	51.08
1886......	26.79	27.45	37.60	52.87	60.18	68.03	74.83	70.19	65.25	54.90	44.56	29.59	51.02
1887......	29.09	32.02	32.25	46.33	63.75	69.60	78.18	70.01	61.82	52.17	41.40	33.81	50.87
1888......	22.97	29.30	29.99	46.03	58.02	70.85	70.71	72.56	62.81	48.61	45.45	34.74	49.33
1889......	35.74	27.75	39.74	51.21	63.53	70.47	73.21	70.55	65.16	49.72	44.74	39.97	52.65
1890......	37.62	37.93	35.59	49.07	60.25	70.08	73.12	72.74	67.13	54.50	43.91	29.90	52.65
1891......	33.82	36.48	35.78	49.73	57.77	71.38	72.39	75.45	71.56	54.71	44.26	42.25	53.80
1892......	31.49	33.44	34.16	48.84	59.16	73.54	74.93	74.26	64.65	53.03	43.39	32.22	51.75
1893......	23.66	29.35	35.52	46.37	58.15	68.14	73.61	73.54	63.27	56.18	42.87	34.46	50.42
1894......	33.50	28.60	42.70	49.20	60.90	70.40	74.90	70.50	68.80	55.30	41.50	36.70	52.70
1895......	29.70	24.10	35.30	50.00	62.40	72.80	72.50	75.60	70.80	52.40	47.80	38.10	52.60
1896......	29.80	31.90	32.60	52.30	67.00	69.80	76.80	76.10	67.20	53.80	49.90	34.20	53.40
1897......	30.80	33.10	40.80	50.50	61.40	67.40	75.90	73.20	66.90	56.50	46.00	38.20	53.40
1898......	35.20	35.70	45.60	47.70	58.30	71.10	76.00	75.30	70.20	59.40	45.50	34.50	54.50
1899......	31.40	27.80	37.80	49.50	62.30	74.10	76.20	75.10	66.10	58.60	46.00	38.10	53.50
1900......	31.80	30.20	33.30	49.90	59.60	70.40	76.40	76.20	70.50	61.20	49.10	36.20	53.70
1901......	32.50	26.30	38.30	47.70	57.30	70.50	77.70	74.90	68.10	55.90	39.60	35.60	52.00
1902......	30.60	29.70	44.40	50.50	58.90	66.80	72.70	71.90	66.70	58.10	51.60	32.50	52.80
1903......	30.30	33.10	44.70	51.90	62.80	64.20	74.60	69.00	67.00	58.00	42.10	31.50	52.40
1904......	25.20	25.30	36.40	46.60	63.40	70.10	74.60	72.90	66.70	53.70	42.40	30.30	50.60
1905......	29.30	24.70	40.30	49.90	61.40	69.80	77.00	74.20	69.60	59.30	44.10	38.80	53.20
1906......	38.30	32.80	35.60	51.60	63.00	73.50	77.00	77.10	70.10	57.50	45.50	34.10	54.60
1907......	34.90	25.90	42.50	46.60	56.20	68.50	77.40	73.40	66.90	52.60	46.20	38.70	52.40
1908......	33.40	27.40	41.40	52.20	63.40	72.90	79.80	75.70	68.50	60.80	46.70	37.50	54.90
1909......	34.70	37.70	37.80	48.40	61.00	72.10	73.50	72.20	66.80	54.50	49.50	32.40	53.30
1910......	31.20	30.00	43.00	55.10	61.10	68.70	77.20	72.10	69.40	58.80	42.30	30.00	53.30
1911......	36.30	31.30	34.70	47.80	64.10	69.80	77.60	72.80	67.60	56.20	42.70	39.40	53.40

At the first glance at these figures one notices the tendency of increase toward the end of the table. The year 1908 has the highest recorded mean and the year 1888 the lowest. The difference of these mean temperatures is 5.6° F. The mean temperature of the decade 1881-1890 is 51.4°, whereas the means of the two following decades are 53.0°.

To illustrate more plainly the increase of temperature I have computed the means of consecutive *lustra*. On Figure 2 these figures are expressed graphically together with those obtained in the same way from annual means recorded in Warsaw and Batavia. The degrees Centigrade have been transformed into degrees Fahrenheit to allow of easier comparison.

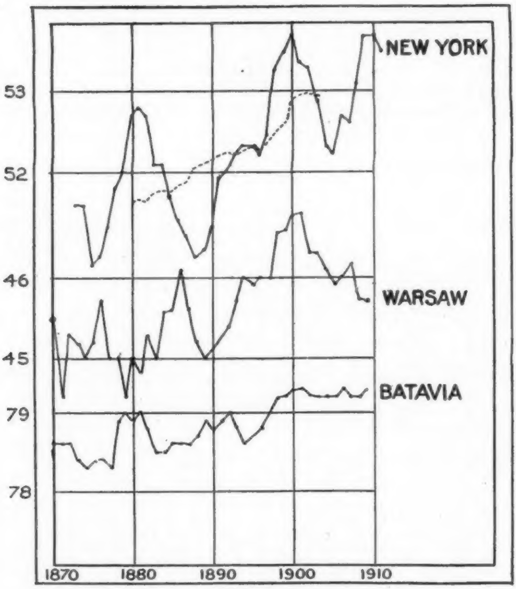

FIG. 2

The increase of temperature for New York is certainly partially due to the influence of the increase in the size of the city. But to ascertain exactly to what extent the growing city has influenced the recorded temperatures is a very difficult problem. In my paper on the secular variation of the climate of Warsaw* I have already referred to this question. Now, if one compares the curve of the

* *Prace matematyczno-fizyczne*, Warsaw, 1908.

temperatures recorded in Warsaw with the curve of New York, the similarity of these two curves for the periods from 1882-86 to 1903-07 is most remarkable. The ascent of the two curves is also practically the same. For Batavia, which is an equatorial station, it is smaller.

The fluctuations of the curve of New York are smoothed out in the consecutive mean curve of groups of twenty years, represented on Figure 2 by a dotted line.

A comparison of the curve of consecutive monthly means (T in Fig. 1) with the five-year and twenty-year mean curves, immediately shows that the length of the records is insufficient to permit any study of long-range periods and secular variations. The curve of consecutive monthly means shows plainly how irregular the short variations are. The waves of a mean duration of twenty-five months differ very greatly one from another in amplitude as well as in the length of time they cover.

The same must be the case with those variations for which the difference between the two characteristic crests of the curve of the five-year means for New York is nineteen years, and I think that it could not be otherwise with the long range variations of the ascending curve of twenty-year means.

The crests and depressions of the curve of consecutive monthly means evidently correspond to pleions and anti-pleions† of my maps of annual departures of temperature. The maps of North America, for the years 1891 to 1900, have been published in my "Enchaînements des variations climatiques" (Brussels, 1909), those for the years 1900 to 1909 for the United States and Canada have not been completed: they will be discussed later, in one of these studies on climate and crops, together with a series of curves of consecutive means for different localities.

On the curve of consecutive monthly means (Fig. 1) we notice the drop of temperature from 1891 to 1893. On the map for 1891 published in the work just cited (Fig. 34, p. 100), a pleion covered Canada, and the center of a very extensive anti-pleion was located in Kansas. In Dodge, Kan., the departure from the ten-year mean was –1.0° C. Therefore, on a curve of consecutive means for that locality we would have had a depression corresponding to the crest of New York. The following year, the drop of temperature in New York is evidently due to the advance of the anti-pleion, as the map for 1892 in the same publication shows plainly. In 1893 the center of the anti-pleion was in Winnipeg; the center of the pleion in Texas. This pleion spread out and its center moved northward

† For definition of these terms see the first paper of this series, *Bull.*, Vol. 42, 1910, p. 271.—Ed.

in 1894: hence the ascent of the values of consecutive means in New York.

The maps show that, during these four years, a variation precisely reversed from the curve of consecutive means of New York must have been observed in Arizona or New Mexico. In order to verify this conclusion I made consecutive means for Santa Fé, N. M., and found a confirmatory result. The question now arises how a passing pleion (a crest of the curve) or a passing anti-pleion (a depression of the curve) may affect the mean temperatures of individual months.

To answer this question I have collected a great amount of material, the discussion of which will be deferred to a later occasion.

The first sub-question to be taken into consideration is the range of possible variation. From the tables of mean monthly temperatures observed in New York during the years 1822-1869 and 1869-1911, I computed the differences between the highest and lowest values. For January, for example, the highest observed monthly mean is 39.6°, the lowest 22.2°, the difference is 17.4°. The figures for the different months of the year are, in chronological sequence, beginning with January: 17.4°; 19.8°; 18.9°; 14.0°; 15.2°; 14.8°; 11.8°; 11.5°; 12.7°; 15.4°; 14.6°; 20.0°. We notice, therefore, much higher values from December to March than from July to September. For New York, the summer months are the months for which the mean temperatures are bound to be the most alike from one year to another. I say expressly in New York because it is not so everywhere. In Australia, for example, it is exactly the contrary. The curves of possible range of variation are different in the different parts of the world, and they are particular to certain types of climate.

The above figures lead us to the conclusion that in New York the passing pleions and anti-pleions may have a greater effect on the winter than on the summer temperatures. In Australia the reverse is the case.

The following figures (Table V) are monthly departures for 1903, 1904 and 1905 from the corresponding monthly means of the decade 1901-1910:

TABLE V.

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1903	−1.8°	+3.8°	+4.3°	+1.9°	+2.0°	−5.5°	−1.5°	−4.3°	−1.0°	+1.1°	−2.9°	−2.6°
1904	−6.9°	−4.0°	−4.0°	−3.4°	+2.6°	+0.4°	−1.5°	−0.4°	−1.3°	−3.2°	−2.6°	−3.8°
1905	−2.8°	−4.7°	−0.1°	−0.1°	+0.6°	+0.1°	+0.9°	+0.9°	+1.6°	+2.4°	−0.9°	+4.7°

These figures correspond to a most characteristic depression of the curve of consecutive means. This depression contains two small crests. The departures of Table V show the significance of these small auxiliary crests. From February to May, 1903, we have positive departures: these months were warmer than the ten-year means; in particular, the mean of March was 4.3° too high. Then we notice a sudden drop of temperature; June is 5.5° and August 4.3° below the average. Another period of cold extends from November, 1903, to April, 1904; with a January temperature of 6.9° below the average. Then May is too warm and from May on the monthly means fall progressively lower and lower below the average until February, 1905. The conclusion is, therefore, that this very characteristic anti-pleion, was composed of groups of cold months: it was not one wave but a group of waves.

A further analysis would require the study of the daily records, the study of the entire succession of temperature waves. On the ocean we notice ripples, waves, groups of waves, the swell, and tidal waves. There is some similarity between the different sorts of waves of the sea and the oscillations of temperature.

In the following table (Table VI), I give the monthly means of temperature for decades of years, in the form of departures from the corresponding annual means:

TABLE VI.

DECADE	MEAN	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1871–1880..	51.8°	-21.3°	-20.6°	-14.6°	-3.9°	+9.2°	+18.6°	+23.7°	+21.6°	+13.5°	+3.7°	-10.3°	-19.9°
1881–1890..	51.4°	-22.9°	-20.9°	-17.1°	-3.0°	+9.1°	+18.8°	+23.0°	+20.5°	+14.8°	+2.6°	-7.7°	-17.5°
1891–1900..	53.0°	-21.9°	-21.9°	-15.7°	-3.6°	+7.7°	+17.9°	+22.0°	+21.5°	+15.0°	+3.1°	-7.4°	-16.5°
1901–1910..	53.0°	-20.9°	-23.7°	-12.6°	-3.0°	+7.8°	+16.7°	+23.1°	+20.3°	+15.0°	+3.9°	-6.0°	-18.9°

This facilitates the comparison of the figures. Indeed, we notice immediately some sort of shifting of the yearly variation, because the February departures increase in negativity whereas the September departures increase in positivity. May and June also display a tendency to become cooler.

In order to show another curious peculiarity of the changes in the yearly variation of temperature (if considered by groups of years) I give below (Table VII) the differences of the *lustrum* means for January plus February and July plus August, the coldest and the warmest months of the year.

TABLE VII.

MONTHS.	*1869-1873*	*1874-1878*	*1879-1883*	*1884-1888*	*1889-1893*	*1894-1898*	*1899-1903*	*1904-1908*
Jan. + Feb. .	31.35°	31.00°	30.45°	27.85°	32.73°	31.24°	30.37°	29.72°
July + Aug. .	74.29°	74.82°	73.62°	73.30°	73.38°	74.68°	74.47°	75.91°
Diff.	42.94°	43.82°	43.17°	45.45°	40.65°	43.44°	44.10°	46.19°

The variation of the July plus August temperatures is interesting: they decrease from the *lustrum* 1874-1878 to 1884-1888, and from then on show a very marked increase. The January plus February mean temperatures show a break of continuity between 1884-88 and 1889-93. The differences, or annual amplitudes, show this break more plainly.

Taking into account single years and computing the differences between the warmest and coldest month, for each year, we notice in these figures a striking tendency of increase from 1869 to 1888. Then comes the break, and from 1890 to 1908 we notice increasing differences. But this increase is far from being regular.

Returning now to the question of traveling pleions and their influence upon the monthly means, it is clear that everything would be simple if the pleions would pass by New York at regular intervals, of, let us say, twenty-five months, and if they would always follow the same direction and be of regular, never changing amplitude. Then, indeed, the seasonal variation of temperature being also presumably perfectly regular, the pleionian anomaly would transpose itself by nearly a month every second year, and long in advance we would know if the winter, the spring or the summer of a particular series of years would be colder or warmer than it ought to be.

But since this is not the case and since, on the contrary, every temporary anomaly is the product of the coadjustment of many variable factors, one must be astonished that the changes in the yearly variation of temperature are not more irregular than they are and that, on the contrary, they present some systematic particularities.*

Considering now all that I have said about the climatic changes

* Referring to the figures of Table IV for the values for individual months, the September temperatures subsequent to 1894 are seen to fluctuate between 66.1° and 70.8° whereas from 1869 to 1880 they ranged from 60.8° to 68.3°. The temperatures of the month of February show a decreasing tendency from 1877 to 1905. The July temperatures are most interesting: they show an increase from 1888 to 1901, and a new progressive increase from 1902 to 1908. The differences, December minus January and more especially August minus July, represented graphically on a diagram, display really curious tendencies of variation.

recorded in New York City as being a parenthesis between my article on the variations of atmospheric temperature at Arequipa (*Bull.*, Vol. 44, 1912, pp. 598-606) and the researches which I am pursuing at present on the temperatures recorded in the United States from 1900 to 1909, I will correlate these two subjects by giving the curves of consecutive means for several stations along the Atlantic Coast.

On the accompanying diagram (Fig. 3) I reproduce the temperature curves of Key West, Tampa, Savannah, Raleigh, Washington, New York, Portland and Eastport, together with the curve of Arequipa for the decade 1900-1910.

The Arequipa curve descends; all the others, on the contrary, are ascending curves. This contrast leads to the conclusion that the pleionian crests are independent of the long-range variations. Annual departures from a ten-year mean may therefore lead to very erroneous conclusions. For Arequipa, for example, the annual means for 1901 and 1902 are higher than the average of the decade taken into consideration; they form positive departures although belonging to a depression of the curve. This is a strong argument against using such departures without considering at the same time the trend of the curves. Now, the Arequipa curve has four crests and four depressions. So has the curve of New York. The most important difference between the two curves is that the maxima and minima of the curve of New York occur a few months later than those of Arequipa. One may say about three months later.

All the other curves are identical with the curve of New York in some particulars. For example, the depression of 1904 appears on all curves. It occurs sooner in Tampa and Savannah than in Raleigh, Washington and New York. In Portland, and even more so in Eastport, this depression is very much retarded. The first crest in the Eastport curve, furthermore, reappears, although greatly diminished, in the first depression of New York, which latter corresponds to that of Arequipa. One can follow the gradual attenuation of this feature going south. For 1902 we have a positive departure in Eastport belonging to a pleion. This pleion (1901-1902) has evidently nothing in common with the equatorial variation of Arequipa and other tropical stations. It is another wave having another origin and whose occurrence is marked all along the Atlantic Coast in the midst of the anti-pleionian deficiency of temperature.

After 1905 the curves of the southern stations differ greatly from the Arequipa curve. The curves of the northern stations, on the contrary, are similar to the curves of Arequipa and New York,

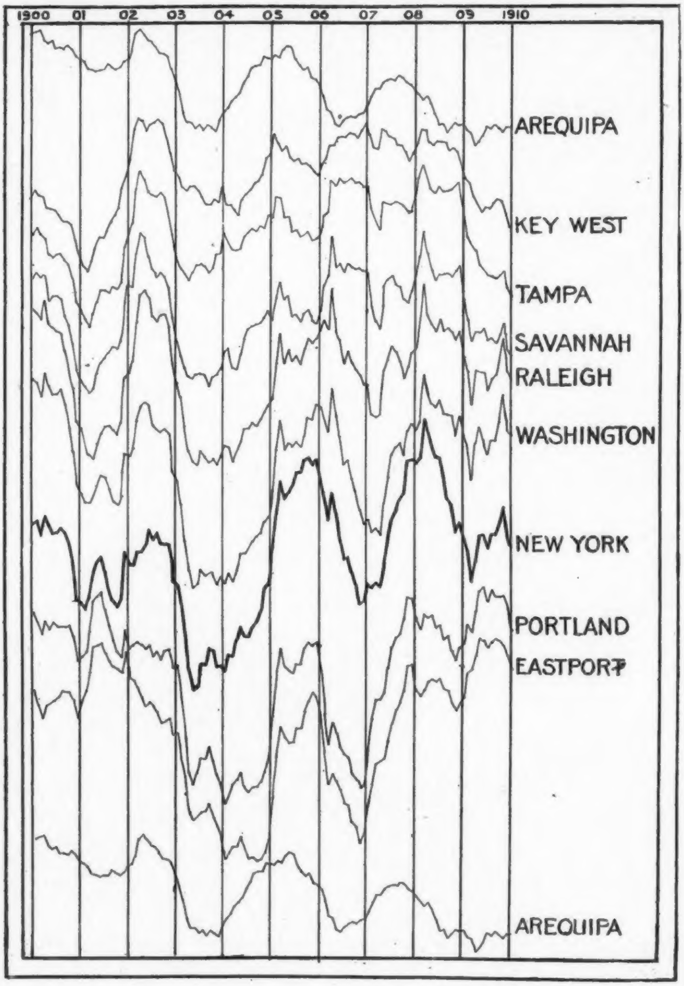

FIG. 3—Consecutive Temperature Curves, for the Years 1900–1910, of Several Stations in the Eastern United States Compared with that of Arequipa, Peru.

except at the end. In Eastport we indeed notice a crest between 1909 and 1910 which is not a retarded crest, and, going south, we observe the same attenuation of this phenomenon as between 1901 and 1902.

One may ask if the consecutive temperature curve of New York always follows the equatorial variation. A comparison with the curve of Batavia, at least, for the years previous to 1900, shows some similarities but also some striking differences.

DOBBS FERRY, N. Y., Sept. 30, 1912.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

ANNUAL MEETING OF THE SOCIETY. The annual meeting of the Society was held at the Engineering Societies' Building, No. 29 West 39th Street, on Tuesday, Jan. 21, 1913 at 8.30 o'clock. Vice-President Greenough in the Chair. The following persons recommended by the Council were elected Fellows:

Hiram Bingham,
Henry A. Budd,
French E. Chadwick,
Nicholas E. Crosby,
Charles B. Curtis,
Preston Davie,
John H. Emanuel Jr.,
Albert Gallatin,
Arthur W. Hart,
William R. Hearst,
Richard R. Hice,
Thomas McD. Hills,
Miss P. R. Kautz-Eulenburg.
Adolph Kuttroff,
Hopper Lenox Mott.

Dr. Francisco P. Moreno of Buenos Aires was elected a corresponding member.

REPORT OF THE COUNCIL

The Annual Report of the Council was presented and read:

January 16, 1913.

To the American Geographical Society:

The Council respectfully submits the following report for the year 1912:

The number of Fellows on January 1st was 1,173. The additions have been 101; the losses by death, resignation, etc., 115; and the total Fellowship on December 31 was 1,159, of which number 365 are Life Fellows.

There have been added to the Library 1,620 books, 3,953 periodicals and pamphlets, 1,194 maps and 17 atlases.

There were published in the *Bulletin* besides the Geographical Record, the Book Reviews, Map Notices and Bibliographical Lists, sixty-one papers, all but two of which were original contributions. The index to the volume for 1912, over 100 pages in length, is a comprehensive record of the geographical literature and cartographic products added to the library and map room during the year.

Seven meetings of the Society were held, at which addresses were made by Charles Wellington Furlong, Mura Bayly, Lieut. Charles F. Gammon, W. S. C. Russell, George Kinney, Leon Dominian and Miss Marion Cock.

The Charles P. Daly Medal was awarded to Captain Roald Amundsen in recognition of the value of his magnetic observations in the American Arctic, the achievement of the Northwest Passage and the attainment of the South Pole.

The Society celebrated the sixtieth anniversary of its founding, and the first of its occupancy of its new building by a Transcontinental Geographical Excursion (August 22-October 17) under the management of Professor William Morris Davis. Forty-three distinguished European geographers representing foreign geographical societies and universities were guests of the Society. American geographers accompanied the Excursion a part or all of the way and described to the visitors many regions they had especially studied. There is in preparation a memorial volume to contain a history of the excursion and many papers contributed by European guests. The funds of the Society were not drawn upon because of this excursion, the expenses of which were entirely covered by donations from members of the Council.

In collaboration with the American Museum of Natural History the Society has, to a modest extent, aided an expedition for the exploration of Crocker Land and its neighborhood about to be undertaken by a party of scientists under the leadership of Mr. D. B. MacMillan. The Council commends this expedition to the public as likely to result in an increase of geographical knowledge and therefore worthy of support.

A loan collection of 700 photographs was opened to the general public in the Society building from September 27 to December 5. The collection illustrated scenery, phases of agriculture and many other activities in the western and southern parts of this country. The attendance was over 2,500.

For information as to the finances reference is made to the annual report of the Treasurer herewith presented.

Respectfully submitted,

CHANDLER ROBBINS,
Chairman.

PAUL TUCKERMAN,
Secretary.

Report of the Treasurer for 1912

The Report of the Treasurer, Mr. Henry Parish, Jr., was read:

General Account

The Treasurer respectfully reports:

On January 1st, 1912, there was on hand a balance of..		$1,558.88
During the year there have been received for Fellowship Dues, Sales of Publications, Interest on Investments and Donations............................	$35,601.75	
Mortgage investments paid off in part.................	375.00	35,976.75
Total		$37,535.63
There have been expended for Salaries, Meetings, Library, Publications, Exploration, House Expenses, Insurance, Postage, &c..........................		34,458.61
Leaving a balance on hand December 31st, 1912		$3,077.02

The reports of the Council and the Treasurer were approved and ordered on file.

Report of the Special Committee

The Report of the Special Committee, charged with the duty of selecting candidates for the offices to be filled was presented and read:

New York, December 15, 1912.

The Special Committee appointed November 21st, 1912, to nominate and recommend to the Society, suitable persons to be elected in January, 1913, to

fill vacancies then existing in its offices, report that they recommend the election of the following named persons to the offices designated:

		TERM EXPIRING IN
Vice-President	WALTER B. JAMES, M. D.	1916
Treasurer	HENRY PARISH, JR.	1914
Recording Secretary	HAMILTON FISH KEAN	1916
Councillors	REAR ADMIRAL FRENCH E. CHADWICK	1916
	FRANK BAILEY	1916
	LEVI HOLBROOK	1916
	CHARLES A. PEABODY	1916
	PAUL TUCKERMAN	1916

[SIGNED] JOHN GREENOUGH,
JAMES B. FORD,
ARCHIBALD D. RUSSELL,
Committee.

The vote of the Society was unanimously in favor of the persons recommended by the Council and they were declared duly elected.

Vice-President Greenough then introduced the speaker of the evening, George B. Dexter, Esq., who addressed the Society on "French, Arab and Roman towns of North Africa." The very interesting and instructive lecture was illustrated by an unusually large number of stereoptican views.

SPECIAL MEETING OF THE SOCIETY. The Society held a special inter-monthly meeting on Jan. 7, 1913, at the Engineering Societies' Building. The house was filled by members and their friends who listened to Mr. Vilhjálmur Stefánsson who told of his "Five Years of Arctic Exploration from Bering Strait to Coronation Gulf." The lecture was illustrated by lantern views.

THE CHARLES P. DALY MEDAL PRESENTED TO CAPTAIN AMUNDSEN. On January 14, Captain Amundsen delivered his lecture on "The Attainment of the South Pole," at Carnegie Hall under the auspices of the American Geographical Society, the American Museum of Natural History and the Norwegian National League. Prof. Henry F. Osborn, President of the American Museum of Natural History presided. After speeches by Prof. Osborn and Admiral Peary, Vice-President John Greenough, on behalf of the American Geographical Society presented to Capt. Amundsen the Charles P. Daly Medal in recognition of his distinguished scientific work and discoveries in the Arctic and Antarctic regions. After expressing his appreciation of the honor conferred upon him by the American Geographical Society and his sense of indebtedness to that Society, the American Museum of Natural History, and the Norwegian National League under whose auspices he appeared on the platform in New York, Capt. Amundsen gave a very graphic account of his Antarctic labors and his journey to the South Pole illustrated by stereoptican views and moving pictures. The lecture was identical in content with that delivered by Capt. Amundsen before the Berlin Geographical Society on Oct. 9, 1912, a translation of which appeared in the *Bulletin,* 1912, No. 11, pp. 822-838. Capt. Amundsen will remain for some months in this country and Canada and will lecture in a large number of cities.

NORTH AMERICA

GEOLOGICAL AND NATURAL HISTORY SURVEY OF CONNECTICUT. This Survey is investigating the water resources of the state in cooperation with the U. S. Geological Survey. The work is under the charge of Professor Herbert E. Gregory of Yale. The Fifth Biennial Report of the Survey says it has seemed especially desirable to carry on this investigation now as, in recent years, most of the large towns of the state have been threatened with water famine, the consumption of water for domestic and manufacturing purposes is increasing and

in the near future manufacturing industries must depend more largely upon water power. Irrigation also is destined to be more important in the development of the state's agriculture as the farmers often suffer heavy losses from drought. In view of the growing demands upon Connecticut's water supply there was evident need of a thorough study of it.

MR. HARRY V. RADFORD IN NORTHERN CANADA. The Society has received a letter from Mr. Radford dated "Head of Schultz Lake, 64°40′ N., 98°27′ W., March 19th" where he spent the winter of 1911-1912. *(Bull.,* Vol. 44, pp. 46-47 and 608-609). He writes:

"With the rigors of the Barren Ground winter beginning to wane my assistant, Mr. Street, and myself will leave to-morrow for the Arctic coast which we hope to reach in about six weeks at the head of Bathurst Inlet. If the west coast of Bathurst Inlet is still unsurveyed I hope to survey it. Chief Akulak and two other Eskimos will go with us as far as Bathurst Inlet so that our party will number five. We will start with two native sledges, twelve feet in length, and twenty-two dogs, sixteen of which are my own, the others belonging to the Chief. Our nineteen foot cedar Peterborough canoe will be carried on one of our sledges and our plan is to transport it in this manner over the sea ice, westward along the coast, until mid-summer when conditions may permit us to proceed in the canoe. If overtaken by the freeze-up before reaching the lower Mackenzie we will again take to the ice or land and proceed with new sledges obtained from Eskimo whom we hope to meet. This plan, however, depends upon our meeting Eskimo in Bathurst Inlet for I have been compelled to promise the Chief that he and the other two men may return home from that point with one of our sledges and some of our dogs. If we do not find Eskimo in Bathurst Inlet we will have to return south with the Chief; but if we can secure help from the northern Eskimo we hope to reach Fort McPherson near the Mackenzie Delta by Christmas and Dawson on the Yukon by the end of winter. If I do not reach Dawson it will probably mean merely that I found it necessary or safer to remain on the coast spending another winter there with the Eskimos.

"Mr. Street and I have collected and compiled as much scientific data as was possible under the circumstances. In the dead of winter, in temperatures ranging between -40° and -60°, Mr. Street made journeys aggregating 700 miles during which much new ground was covered and some geographical discoveries were made. He collected ethnographical data in several Eskimo communities. I remained at our headquarters at Od-e-uk-tellig through the winter in order that our meteorological record for this station might be unbroken. As far as I know we are the first white men to have passed an entire winter in the interior of the Barren Grounds."

THE ASSOCIATION OF AMERICAN GEOGRAPHERS. This Association held its ninth annual meeting at New Haven, Conn., on December 27-28, 1912. The sessions were held in Lampson Hall, Yale University, and an informal meeting took place on Friday evening at the Graduates' Club. In the absence of the President, (Professor Salisbury), Mr. M. R. Campbell, the first Vice-President, presided. About thirty members attended.

It is gratifying to the members to see the increasing number of papers on anthropogeography, regional geography, and climatology, that deal with human relations, a feature less prominent in the earlier programs of the Association. Seven purely physiographic papers were presented out of a total of sixteen. Great interest is manifested in the Annals of the Association since the appearance of the first volume during the past year. The publication committee has performed a distinct service to geographic science in securing papers of high quality for its volume.

The newly-elected officers for 1913, are: President, Henry G. Bryant; First Vice-President, Ellsworth Huntington; Second Vice-President, Charles C. Adams; Secretary, A. P. Brigham; Treasurer, F. E. Matthes; Councillor for three years, R. DeC. Ward. The publication committee appointed for two years (1913

and 1914) consists of R. E. Dodge, Editor, and Alfred H. Brooks, H. E. Gregory, and H. H. Barrows. ISAIAH BOWMAN, Acting Secretary.

LECTURES BY PROFESSOR DAVIS AT COLUMBIA UNIVERSITY. On January 14, 15 and 16, a series of three lectures, open to the general public, was given by Professor W. M. Davis at Columbia University under the auspices of the Department of Geology. The subjects of the three lectures were: Dana's Contribution to Darwin's Theory of Coral Islands; The Valley of the Armançon: A Study in Physiographical Analysis; The Principles of Geographical Exposition. In the first lecture, the topic of which was suggested by the centenary of Dana's birth, Professor Davis, after reviewing Darwin's theory and subsequent criticisms of it, drew attention to the fact that Dana, by referring to the predominance of deeply indented shore lines among coral islands (to be ascribed to the drowning of their valleys), added independent testimony to the theory of subsidence, although Darwin never realized this owing to the fact that Dana made the statement casually in a footnote. The subject of the second lecture is treated in detail in a recent number of the *Annales de Géographie* (No. 118, Vol. 21, 1912, pp. 312-322). In the third lecture, Professor Davis repeated his facetious reference, well-known to his recent associates, to the existence of 297 methods of geographical exposition which, by the elimination of methods of inferior quality and of elementary degree, resolve themselves into so tractable a number as eleven, and concluded with an appeal for the use of the explanatory rather than of the empirical method.

GEOGRAPHICAL EXHIBITION AT TEACHERS COLLEGE. An exhibition of geographical text books, atlases, wall maps and other material for the teaching of geography is on view in the Museum on the second floor of Teachers College, Columbia University (entrance on West 120th Street). The exhibition will be open until March 15 from 9 A. M. to 12.30 P. M. and from 2 to 5 P. M. on week-days except Saturday and, on Saturdays, from 9 A. M. to 12 M. The exhibit, which includes foreign text books, is comprehensive and well arranged. It will amply repay a visit.

CANADIAN IMMIGRATION. The Report on Immigration for the fiscal year 1911-12 issued by the Department of the Interior, Canada *(Annual Report,* Part 2, 1912) says that the immigration proper into Canada by ocean ports during the year was 220,527 persons which together with the 133,710 settlers from the United States brings the total immigration to 354,237, an increase over the preceding fiscal year of 43,153. Of the many nationalities represented were, 95,107 English, 32,988 Scotch, 8,327 Irish, 4,871 Austrians, 13,346 Ruthenians, 1,601 Belgians, 3,295 Bulgarians, 6,247 Chinese, 2,094 French, 4,645 Germans, 9,805 Russians, 4,460 Russian Jews, 7,590 Italians, 2,598 Newfoundlanders, 2,394 Swedes, and 1,692 Norwegians. A noticeable increase in the proportion of British immigrants settling in the prairie provinces is worthy of mention. In quantity and in quality, the immigration far surpasses anything hitherto known in the history of immigration to the Dominion. An increasing number of families are coming and the practice of the husband preceding his family to begin the improvements on his homestead before their arrival is falling into disuse.

In 1912, 233,068 acres of spring breaking in Manitoba was sown to wheat for the first time. The area under wheat in Alberta was about the same as in 1911 but in Saskatchewan, 2,300,000 acres of new land yielded their first crop in 1912. The efforts to provide rail transportation for the vastly increasing crops of the western prairies are still inadequate.

ASIA

IRRIGATION IN MESOPOTAMIA. According to the *Geographical Journal* (Vol. 40, No. 5, Nov., 1912, pp. 561-2), about 600,000 acres of land will soon be plentifully irrigated in Mesopotamia as a result of the work which is being carried out for the Turkish government by the engineering firm of Sir John Jackson, Limited, in accordance with the plans of Sir William Willcocks. The part of the scheme first taken in hand has been the building of the great barrage at Hindieh, with associated works by which the water is to be dis-

tributed down the old branch of the river, past the site of Babylon, to Hilla. The barrage is being built to the east of the present bed of the Euphrates, and will be 250 meters long, with thirty-five arches fitted with sluice-gates. This barrage will raise the level of the water by seven meters, while a subsidiary barrage immediately below will provide for a further difference of 2½ meters. Adjoining the upper barrage there will be a lock for the use of the river traffic, while the lower barrage consists of a lock and a huge shelf of masonry. Work has also been begun on the Hilla regulator, a little above the barrage, which will consist of five arches. The excavation for this has been done, and the masonry begun. These works finished, an earthen dam will be thrown across the stream, which will thus be turned into its new bed between the barrage and the regulator. The old branch has been cleared out, and will be properly canalized, while at Habbania an escape is being constructed by which the flood-water will be carried off into the old Babylonian reservoir.

PROPOSED SCIENTIFIC EXPEDITION TO THE KARAKORAM. Dr. Filippo de Filippi has submitted to the Royal Geographical Society the plan for a scientific expedition to the western Himalaya and Karakoram which he will carry out if sufficient funds are secured. He gained his experience there with the expedition of the Duke of the Abruzzi. Dr. de Filippi's plan relates mainly to work in various branches of physical geography to be carried out by specialists with the best modern instruments. The problems concern topography, geology, gravity, magnetism, the various forms of radiation (thermical, photochemical, photoelectrical, light-polarization, etc.), atmospheric electricity (potential gradient, electric conductivity, induced radio-activity, penetrating radiation and ionization of the air). To these subjects would be added studies in meteorology, with the special view of investigating the higher atmosphere with kites carrying self-registering instruments sent up from stations of high altitude. The special physical characteristics of the Himalaya-Karakoram region, added to the comparative facility with which high altitudes can be reached in it, to the dryness of the atmosphere, etc., afford unique opportunities for these researches. It is proposed to carry on the investigations from Kashmir, over the Himalaya range and through Baltistan and Ladakh into Chinese Turkestan. The work would extend over a period of more than a year. He also proposes to explore and map the still unknown portion of the Karakoram between the Siachen Glacier and the Karakoram Pass. The amount needed to cover the expenses is about $50,000, half of which has already been contributed abroad. The *Geographical Journal* from which these facts are taken (Vol. 45, 1912, No. 5, p. 559), says that Dr. de Filippi's familiarity with the problems of scientific geography is a guarantee of the success of the undertaking.

EUROPE

A NEW FIELD OF INVESTIGATION IN EUROPE. The passing of a large share of Turkish sovereignity in Europe opens up a rich field of investigation in various branches of study. Heretofore scientific research in any of the vilayets was beset with difficulties, if not perils, owing to the ill-will of Turkish officials and the unsettled condition of the country. The result is that the territory constituting European Turkey is still the only portion of Europe left which offers practically a virgin field to the modern geologist, geographer and historian.

In geological investigation both general and regional work is needed as well as correlation. The economic phase is one which is by no means devoid of importance. The geography of the region has been worked only along general lines. The field for regional investigation is particularly alluring. Practically every mile of territory needs mapping. The two most reliable cartographic works to which reference may be had at present are the General Karte von Central Europa, on a scale of 1.200,000 published by the k. k. Milit.-Geogr. Inst. of Vienna and the Map of Turkey in Europe: Eastern and Central, 1:250,000, published in 1910 by the Geographical Section of the British General Staff. Both of these documents need thorough revision based on actual field work. To judge from the published sheets of the 1:50,000 map of Bulgaria compiled by the Military Cartographical Institute at Sofia there is

promise of good cartographic work in store for the region which is expected to become part of Bulgaria.

The region is exceptionally interesting to the historian. Students of Greek, Roman, or Byzantine history can now feel that they will soon be able to proceed on their researches unhampered by Turkish officialdom. Ethnographers will also have a splendid field before them. The relation of the present inhabitants of Albania to the Illyrians found by the victorious Roman legionaries and the evolution of the modern Macedonian from the Thracian inhabitants of pre-Christian days constitute problems of more than passing interest.

LEON DOMINIAN.

A NEW HARBOR IN ICELAND. Thorlakhavn on the south coast of Iceland has been opened as a trading and industrial port. A French Company with a capital of 600,000 francs, has purchased the haven and several large water falls in its neighborhood affording 200,000 horse power, and will erect establishments for the production of saltpetre. Thorlakhavn is the best harbor on the south coast. It is about fifty miles from Reykjavik. (*Geogr. Zeitschr.*, Vol. 18, 1912, No. 7, p. 407).

POLAR

THE REORGANIZED CROCKER LAND EXPEDITION. *The American Museum Journal* (Dec., 1912, p. 309) gives the details of the reorganization of this expedition which was necessitated by the death by drowning of its leader, Mr. George Borup on April 28, last. Mr. D. B. MacMillan, who was to be co-leader with Mr. Borup has been made leader and will have as large a scientific staff as the funds available will permit. Besides having general charge of all the work he will especially devote himself to anthropology and meteorology. Mr. W. Elmer Ekblaw of the University of Illinois will be geologist and biologist and Ensign Fitzhugh Green has been detailed by the U. S. Navy to be an assistant in geology and glaciology and will have charge of a part of the map work. The chief topographer and surgeon are yet to be selected. The surgeon will be expected to do some of the biological work. The party will probably include a general scientific assistant to look after meteorological, seismological and other instruments besides a man to serve as cook and mechanician. Additional subscriptions of about $15,000 are needed to carry out the plans and bring the party back to New York. After exploring Crocker Land, the party will divide, one portion going southwestward from Cape Thomas Hubbard to explore the region north of the Parry Islands.

DR. D. MAWSON'S EXPEDITION TO WILKES LAND. The Sydney correspondent of the London *Daily Mail* (Feb. 16, 1913) says that the *Aurora*, the ship of the Mawson Antarctic Expedition, reached Adelie Land, where Dr. Mawson made his headquarters, took the entire party there on board and the ship had started for Termination Land, 1,200 miles east, to pick up Frank Wild and his six men who had spent the Antarctic summer in the exploration of that region. The news reached Tasmania by a wireless dispatch from Adelie Land which was relayed at Macquarie Island. All the members of the party stationed in Adelie Land were well. The return of the expedition to Australia may soon be expected. The *Bulletin* reported (Vol. 44, 1912, No. 7, pp. 523-524) that the coasts of the Antarctic Continent, mapped by Wilkes, were found by Mawson and Wild to exist more or less in the position which he had assigned to them.

FILCHNER'S ANTARCTIC EXPEDITION. Lieut. Filchner, leader of the German Antarctic Expedition is reported to have returned to Buenos Aires early in January. He cabled that his expedition had been successful but his work was not completed and he intended to continue it. He said that he had discovered a new land which he had christened Prince Regent Luitpold Land, after the late Regent of Bavaria, and also an ice barrier that he had named the Kaiser Wilhelm II Barrier. It is hoped that more details of the work he has done will soon be accessible.

OBITUARY

WHITELAW REID. The Hon. Whitelaw Reid, LL.D., United States Ambassador to the United Kingdom since 1905, died in London on Dec. 15, 1912. He was a member of the Council of the American Geographical Society. Mr. Reid was born at Xenia, Ohio, on Oct. 27, 1837, was graduated from Miami University, Ohio, in 1856, won distinction as a war correspondent in the Civil War, was long editor in chief and proprietor of the New York *Tribune,* was Minister to France in 1889-92, Republican nominee for Vice-President in 1892 and served New York State and the country in other honored positions.

The Council of the Society, on Dec. 19, ult., adopted the following:

"*Whereas,* Whitelaw Reid, a member of the Council of the American Geographical Society departed this life at London, England, on the fifteenth day of December 1912, and

"*Whereas,* by his reputation, his high attainments in letters and diplomacy, his unfailing helpfulness and ability, he has done much to promote the interests and add to the honor of the name of this Society. Therefore, be it

"*Resolved,* that we, the Council of the American Geographical Society, on behalf of ourself and the members of the Society, desire to place upon record our approval of his great work, to express our profound sense of the grave loss which his death brings to his numerable friends and to the world of affairs, of letters and diplomacy in which he occupied so distinguished a place, as well as to the more immediate interests of this Society in which were numbered so many of his admirers and devoted associates, and to offer to the family of our departed friend the assurance of our profound sympathy; and be it further

"*Resolved,* that this minute be entered on the records of the Society and that a copy of this resolution of sympathy be suitably engrossed and presented to the family of the deceased."

OTTO KRÜMMEL. Prof. Krümmel died at Cologne, on Oct. 18, at the age of 58 years. After attending several German universities he obtained his doctor's degree at Göttingen in 1878. His special study was geography and for several years he was a Privat-dozent in that subject at Göttingen. Becoming Professor of Geography in the University of Kiel in 1883, he turned his attention to oceanography and in a few years became known for his intimate acquaintance with the whole literature of the subject. His own researches in this field added to his reputation as an oceanographer. He took part in the "Plankton Expedition" in the North Atlantic in 1889 and wrote the narrative of the voyage. Later he was prominent both in the organization and in the direction of the physical work on board the German investigation steamer sent out by the International Council for the Study of the Sea. He was also useful in the work which, under the Prince of Monaco, resulted in the production of the great bathymetric chart of the oceans that is now appearing in its second edition. His greatest work was the "Handbuch der Ozeanographie" in two volumes, which appeared in 1907 and 1911 to which he gave prodigious labor. He resigned his chair in Kiel last year to accept the Professorship of Geography in Marburg in the hope that the change would benefit his failing health.

WILLIAM OGILVIE. This well-known Canadian explorer and surveyor died at Winnipeg on November 13, 1912. He was especially prominent in his exploration of the Yukon Valley, the Klondike region and parts of the vast region drained by the upper Peace, Athabaska and Mackenzie Rivers. When the Yukon Territory of Canada was organized, he was appointed administrator. Recently he has investigated and reported upon the proposal for the reclamation of millions of acres of rich land in the delta region of the lower Saskatchewan River, in the neighborhood of Lake Winnipeg. He was the author of a number of books dealing with the Yukon and its early history and descriptive of his various surveys.

GEOGRAPHICAL LITERATURE AND MAPS
(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES
(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

Index to the Stratigraphy of North America. By Bailey Willis. 894 pp. Map in separate case. Index. *Prof. Paper 71, U. S. Geol. Surv. 1912.*

In his Index to the Stratigraphy of North America, Willis has produced a very useful compilation and digest of the knowledge of the sedimentary rocks of the continent. It will be especially helpful to investigators and teachers for it affords much more extended and explicit information than is given in the text books on geology and also more complete references to original sources of publication of detailed memoirs. Morever, it includes many new facts furnished by numerous collaborators. The admirable colored geologic map of North America which accompanies the work has been described in a previous number of the *Bulletin.*

After an explanation of the color scheme of the map, a statement of the sources of information and a brief summary of pre-Cambrian classification, there follows, the descriptive chapters on the systems from Cambrian to Tertiary, which constitute the greater part of the work.

The descriptive matter consists mainly of excerpts from published descriptions as given by authors but there are also many brief abstracts and running explanatory notes by way of introduction and connection. The new material is in the form of brief statements of facts or expressions of opinion regarding interpretation of data or classification of strata.

Under each geologic system the excerpts are arranged under geographical subheads, which are states, groups of states, parts of states, such as southeastern Montana, uplifts such as the Black Hills, and regions such as Southern Appalachians. These are taken up in order of key letters and numbers of the series of rectangles into which the map of North America is subdivided according to the plan of the Standard International Map of the World. Small guide maps of the continent showing the rectangular reticulation are printed under each system and a table at the beginning of the chapter gives the contents that follow. For this reason the subheads are not given in the very brief table of contents at the beginning of the book. This, however, being contrary to the usual custom may prove puzzling at first to users of the work. The index at the end of the volume does not help greatly in this connection because many of its geologic references are grouped in bafflingly long lines of page numbers.

In selecting the material for the Index, Mr. Willis has endeavored to use the latest authoritative statements without attempting to perpetuate the older data believed to be superseded by later information. Owing to this method no doubt some instances will be found in which facts presented in the older writings and still of value may not be fully represented in the Index. In a few instances resumés of data on certain areas have been prepared by collaborators and some of these are somewhat less satisfactory than the selected excerpts.

In the preparation of this Index, Mr. Willis has kept in close touch with numerous field investigators and obtained from them many suggestions and new data which have been of great value to the work. Having access to unpublished maps and other data in the U. S. Geological Survey, he has been able to present many facts which bring the Index up to a very late date.

All available data are also given respecting the stratigraphy of Canada, Mexico, West Indies, Central America, Greenland, Iceland, and the north-

western part of South America. Much of this material has never before been brought together in this systematic form, and some of it is new, having been furnished in manuscript by collaborators.

Although there is but little review of stratigraphic problems, the Index shows the wide field that remains for the study of this branch of geology in most parts of the continent. There are large areas in Mexico and the far Northwest that have received but little attention and doubtless their exploration will throw much light on stratigraphy and geologic history. In the western United States also there are districts of considerable extent that have not been studied closely, and our knowledge concerning them is based on reconnaissance surveys which revealed only the broader features of the geology.

A current problem in stratigraphy which is presented at considerable length in the Index is the separation of the Cretaceous and Tertiary. There are several formations in the border zone between the two systems which remain to be satisfactorily classified.

Works of such character as this Index are of great value to the investigator and especially to the teachers of the science, for they present in condensed form the latest and best information. In many cases, however, the investigator should not be content with excerpts but should consult the original records to obtain more complete data and to be able to give due consideration to the conditions under which they were obtained. For this purpose the Index is a most useful guide to the literature of the science. N. H. DARTON.

U. S. Bureau of Mines.

The Mountain that was "God," being a little book about the great peak which the Indians named "Tacoma," but which is officially called "Rainier." By John H. Williams. 2nd edition, revised and enlarged. 143 pp. Map, ills., index. John H. Williams, Tacoma, 1911. G. P. Putnam's Sons, New York. $1.50. 16 cents postage. 10 x 7.

The second and enlarged edition of a book that has already reached a very large sale and wide reputation. The book is about Mt. Rainier as it is officially known, the overtopping and most magnificent summit of the Cascade Range. No other of our western mountains is so famous and popular and this is because it is not only the grandest, but also the most accessible of our extinct volcanoes. The text is written *con amore* and gives a fine, popular description of the mountain in all its moods and phases. The illustrations, 190 in number, are half-tones of superior quality and include eight full page views in colors. The author deals, good-naturedly and at some length, with the remarkable decision of the U. S. Board on Geographic Names in 1889 when it officially designated the Mountain as Mt. Rainer instead of Mt. Tacoma, the beautiful and euphonious Indian name for the mountain which had come into common use among our people. The name Tacoma, as applied to the mountain, it is gratifying to say, is likely to be perpetuated in popular usage. The tourist and the general reader will find the book very helpful and enjoyable.

Mexico. A General Sketch compiled by the Pan American Union. 387 pp. Maps, ills., index. Washington, D. C., 1911. 9½ x 6½.

The general information in this publication conveys a fair idea of modern Mexico. Whatever be the range of the several topics it is safe to assume that they have all been culled from original sources. Hence the value of the handbook. The broad character of the data presented is indicated by the fact that they relate to geography, history, political divisions, natural resources, commerce, transportation and public institutions. The bulk of the text has already appeared in the *Bulletin* of the Pan American Union. The criticism that naturally occurs is that the book is far too sketchy in character. This is stated because there is an undoubted need to-day for a comprehensive and at the same time authoritative compilation of this kind on Mexico. The Pan American Union is in an exceptionally favorable position to secure all the material necessary and to present it in adequate fashion. Its aim should therefore have

been to offer more than such data as may be obtained by reference to any of the handbooks published on Mexico so far. Of the maps included in the work it must be said that the ones prepared in the Pan American Union Bureau display far better workmanship than the others. LEON DOMINIAN.

The Guardians of the Columbia: Mt. Hood, Mt. Adams and Mount St Helens. By John H. Williams. 143 pp. Map, ills., index. John H. Williams, Tacoma, 1912. $1.50. 16 cents postage. 10 x 7.

This book will have a prominent place among popular works on our western mountain scenery. It has to do with the Columbia River, the three great mountain sentinals, Hood, Adams and St. Helens, which overlook it, the forests on the lava fields, the Alpine Parks, and the adventures of mountain climbers in this region. It is profusely illustrated with the finest of photo-engravings and a number of colored views. The author has evidently aimed to tell the exact facts about the fascinating Columbia country, its noble river and its splendid mountains.

SOUTH AMERICA

Early Man in South America. By Aleš Hrdlička. In collaboration with W. H. Holmes, Bailey Willis, F. E. Wright and C. N. Fenner. xv and 405 pp. Ills., index. *Bull. 52, Bur. of Amer. Ethnol.*, Smithsonian Inst., 1912.

Logically we are to hold an open mind upon the question of the discovery of early man, of early genera of something approximating the human, in the Argentine pampas. This work is the cross-examination, the other side has next its opportunity to produce evidence in rebuttal. Yet, Dr. Hrdlička has made a telling case. Moved by the finds of man or anthropoid in Europe, Dr. Ameghino began to announce similar finds in the Pampas. He far outpassed the anthropologists of Europe in his zeal of discovery; where they were content with the erection of new species of Homo, he created new genera, *Prothomo* (an abominable mess of Greek with Latin, which Sergi quite properly rejects for *Proanthropos), Diprothomo, Triprothomo* and even *Tetraprothomo.*

Now it is a principle in biology that every new species must be based upon a type specimen which must be deposited in some museum where it shall be accessible to such students as may be entitled to examine it. This examination was the purpose of Hrdlička's journey to the Argentine, the examination of type specimens. To assist in this examination he took with him a competent geologist, Bailey Willis, in order that the site of each find might be properly studied. Even while retaining the judicial poise we may acknowledge that the North American representatives made a most exhaustive study of all the material on which the South American scholar has based his conclusions. His rejoinder will be awaited with the utmost interest by every anthropologist.

A heated controversy has already raged, in particular over the fragment of skull upon which Ameghino has erected *Diprothomo platensis.* By reason of this, Dr. Hrdlička took particular pains in dealing with this theme. From an independent examination of survivors who were engaged in the construction of the dry-dock at Buenos Aires in the course of which this skull fragment was found, he was able to make it clear that at no time had there been a distinct determination of the situation and surroundings in which the discovery was made. Passing to the fragment itself he expresses positively the opinion, now generally held by the German anthropologists, that the fragment has been described as in a wholly false adjustment to the normal skull. In support of his posing of the bone, Ameghino has invented a machine for the purpose of cranial measurement which yields exactly the result to which he had already committed himself, whereupon his Smithsonian critic, points out the fact that the machine was invented for the express purpose of producing just this result and none other. Divested of anatomical terminology the crux of the whole situation is this. Ameghino has a fragment of skull extending from the arch above the eyes backward to about the crown. By letting that fragment rest flat on the table before him he visualizes an anthropoid with extremely

low brow and shallow skull cavity. His critics tell him that he is not properly orienting the piece of skull, and the weight of authority is with the critics.

In general, it is to be said that as a result of the study of each of the specimens in Buenos Aires combined with a careful investigation of the site where each was found in the pampas, the conclusion is set forth that not one of the finds is other than modern, possibly not even pre-Columbian; and that in the type specimen of *Tetraprothomo argentinus* the femur upon which the genus is erected is not human at all, but belongs to one of the cat family. In still broader statement the conclusion is reached that there exists not a particle of evidence upon which to rest a belief in the existence of an early man in South America.

WILLIAM CHURCHILL.

AFRICA

'Twixt Sand and Sea. Sketches and Studies in North Africa. By Cyril Fletcher Grant and L. Grant. xii and 504 pp. Map, ills., index. Sampson Low, Marston & Co., Ltd., London, 1911. £1 1s.

The authors have aimed at the adjustment of the history of the past of the High Barbary to its existing ruins. To do this effectively calls for a wide familiarity with the records of Semitic, Roman, Byzantine and Mohammedan culture, to cite only those factors for which literary material of the past is available; and with the several folk movements of obscure Atlas tribes. It by no means appears that the authors have toiled over their sources at first hand as German students would have done.

Even their record of modern times warrants the same comment. In dealing with the piracy of the Barbary corsairs the authors (page 289) mention the blow dealt by Sir Edward Spragg in 1671, followed by this: "at last, in A. D. 1816, a more serious effort was made to put an end to the scandal; Lord Exmouth was sent to Algiers." Within the "at last" is buried the whole record of the fact that the United States had cleared the sea; any workmanlike collation of the historical material should have unearthed the record of Stephen Decatur and the *Philadelphia*. The same loose handling of facts continues when the book touches upon incidents of the present day. In writing about the religious usages of Islam, the five daily periods of prayer which are as easy of proof as the minarets from which the call comes floating down, the authors designate the prayer call *(ezzan)* by the name of the muezzin who calls it to the faithful: (page 412) "the Arab, who is patiently waiting in the minaret, calls the muezzin." A footnote or so indicates the employment of Hughes's "Dictionary of Islam." The very slightest use of that great work should have prevented such a slip. The volume is finely produced. WILLIAM CHURCHILL.

In South Central Africa. Being an account of some of the experiences and journeys of the author during a stay of six years in that country. By J. M. Moubray. xvi and 198 pp. Map, ills., index. Constable & Co., London, 1912. 10s. 6d. 9 x 6.

This book conducts the reader from the port of Beira to the Victoria Falls and then over unfrequented ways through various parts of Northwestern Rhodesia. The chapters are written in the narrative style and contain a large amount of unclassified observations. The author is an engineer and a hunter. His vocation turns his footsteps towards the mines and thus the diggings near the Great Lukanga Swamp, such as Broken Hill Mine, and Silver King Mine, mark stages along the route. The chase of big game forms part of nearly every chapter and the author is not without some skill both as a hunter and a story teller. He dwells at length upon various dangerous insects as the tsetse fly, white ant, mosquito, borer and jigger, and shows that they are the great perils of the country. He has considerable facility in describing the districts through which he passes. As interesting as any area is the Great Lukanga Swamp to which a chapter is devoted and the story of the swamp dwellings and dwellers is a distinct contribution. ROBERT M. BROWN.

ASIA

In Forbidden China. The d'Ollone Mission, 1906–1909. China-Tibet-Mongolia. By Vicomte d'Ollone. Translated from the French of the 2nd Edition by Bernard Miall, 318 pp. Map, ills., index. Small, Maynard & Co., Boston, 1912(?) \$3.50. 9 x 6.

There springs to mind a ready and sympathetic excuse for the thought with which Major d'Ollone closes the record of his nearly four years of exploration of the unknown wilds of Western China. During all these years of toil, of danger, of unflagging zeal, he and his handful of companions had been with the savage hordes. He found them yet instinct with life, not in the least subdued by the might of the surrounding Chinese, not at all swayed by Chinese thought. He had seen them acquiring modern arms of precision and this with no loss of the lust of battle. He calls to mind that he has found the survivals of the hordes which swept down upon imperial cultures under Attila, under Genghis Khan, under Timur. He wonders if the hour of the hordes shall yet again strike. It is on his part no idle wonder, for he has seen the last of the barbarians in their remote home.

This volume contains the popular narrative of the mission of exploration. The scientific results, and they are great in number and promise to prove of great importance, are being now worked out for publication in the most dignified form. This is the day book of adventure, on that account all the more valuable. There is nothing which can quite take the place of such narratives as this, written with the memory keen and supported in the moment of writing by the hasty veracity of the pencilled field notes. In later revision, incidents and details drop out as unimportant, they are lost because of the lack of the interpreter. One instance will suffice. He writes on page 106, of the wild Lolos, that he offered them a book to read in their own character; they turned it about so that the vertical columns became horizontal. I have observed that rotation in vision hundreds of times among savages, but it has passed wholly unconsidered in the science of ophthalmology. This is only the seventh mention of it which I have found in all my reading of the journals of exploration.

In this important mission the Vicomte d'Ollone and his three companions entered China at the back door, their time was spent in the back yard of the empire, they saw it at its least presentable aspect. They were busy with the Miao-tze, the Lolos and the tribesmen of the borderland of the Tibetan mountains. Fitly they crowned their work with sight of the unseeable, with speech of the unapproachable, the great and mysterious figure of eastern Asia. They had word with the Dalai Lama. In this narrative there is no attempt at discussion of the problems of these included races; that is deferred to the appropriate volume of the scientific results of the mission. From original sources, family records of chiefs with whom he made friendship, the traveler discovers that the Lolos are not indigenous to the Great Cold Mountains in whose valleys they now dwell, that their ancestral home was in the southern Yunnan and Kwei-Chu, that early in the eighteenth century after a revolt had been crushed by the Chinese they fled westward across the Blue River to the hills. From the Miao-tze in their own homes he acquires the startling discovery that they are neither Miao-tze nor independent but really Tai, that for some undiscoverable reason the Chinese call them Chong-kya as far as Hing-Yi-fu and immediately beyond that town call them Miao-tze, although there is no difference in any particular. In Tibet the author deals with the Si-Fan. He is quite justified in avoiding the name Tibet, inasmuch as that is quite unknown in that country. Yet Si-Fan, although better comprehended, is equally alien; if Tibet is Arabic, none the less Si-Fan is Chinese, merely the designation of western barbarians. Nomenclature is particularly difficult in the mountain region. There is no name for the country, even the tribes have different designations in summer and in winter.

The scientific volumes which are promised, will be awaited with the most lively interest. But for the general reader this narrative will serve all common ends and will hold the interest on every page. WILLIAM CHURCHILL.

OTHER BOOKS RECEIVED

These notes do not preclude more extended reference later

NORTH AMERICA

The True History of the Conquest of New Spain. By Bernal Díaz del Castillo, one of its Conquerors. From the only exact copy made of the original manuscript. Edited and published in Mexico by Genaro García. Translated into English with Introduction and Notes. By Alfred P. Maudslay. Vol. 4. xiii and 395 pp. Map, ills., index. Hakluyt Soc., London, 1912. 9 x 6. [This instalment comprises the return to the Valley of Mexico, beginning with the march to the City of Texcoco and the siege and fall of the City of Mexico. It ends with an account of the beginning of the Spanish settlement.]

SOUTH AMERICA

Contributions to the Geology of the Falkland Islands. By J. G. Andersson. Wiss. Ergebnisse, Schwed. Südpolar-Exped., 1901-03. Vol. 3, Lief. 2. 38 pp. Maps, ills. Lithogr. Inst. des Generalstabs, Stockholm, 1907. 11 x 8½ [Notes of value on the southern sandstone series of South America.]

AFRICA

Tripolitania e Cirenaica. Climatologia di Tripoli e Bengasi. Studio di Filippo Eredia. 79 pp. Ufficio Centrale di Met. e Geodinamica, Rome, 1912. 9½ x 6½. [Describes the preliminary investigations carried on by the Italians.]

Tripolitania. Di Vittorio Nazari. 110 pp. Ills. Tipogr. Editrice Nazionale, Rome, 1911. L. 2.50. 9½ x 6½. [A short account of the new Italian colony.]

Pionieri Italiani in Libia. Relazioni dei delegati della Soc. Ital. di Esploraz. Geogr. e Commerc. di Milano 1880-96. xi and 403 pp. Maps, ills. Francesco Vallardi, Milan, 1912. Lire 12. 12 x 8. [Condensed accounts of the travels of several explorers. A history of Italian aspirations that led to the conquest of Tripoli.]

EUROPE

Études sur le Climat de la France. Par Alfred Angot. Régime des Vents. 100 pp. Maps. Pression atmosphérique, pp. 83-249. Maps. 13 x 9½ each. [An investigation of the wind régime in France, considered both from the standpoint of meteorology and of aviation. The study of the daily variation of atmospheric pressure leading to the determination of isobars for France.]

Géographie du Département de la Savoie. Par Paul Joanne. 64 pp. Map, ills. 10th edition. Hachette et Cie, Paris, 1912. Fr. 1. 7 x 4½. [A description with a gazetteer of the communes.]

Géographie du Départment des Basses-Pyrénées. Par Paul Joanne. 78 pp. Map, ills., Hachette et Cie, Paris, 1911. Fr. 1. 7 x 4½.

Il Clima di Roma. Esáme delle osservazioni meteorologiche eseguite dal 1782 al 1910. 101 pp. Ufficio Centrale di Met. e di Geodinamica, Rome, 1911. 13½ x 9½.

La Popolazione in Friuli. Parte prima: Densità. By F. Musoni. 50 pp. Maps. Extract, Ann. del R. Inst. Tecn. di Udine. Udine, 1912. 9½ x 6½.

L'Egeo. Di F. Musoni. Conferenza tenuta il 24 Giugno 1912 nell 'Aula Magna del Palazzo degli Studi in Udine. 18 pp. Tipogr. Domenico del Bianco, Udine. 10 x 7. [A sketch of Aegean history.]

The Russian Year-Book for 1912. Compiled and Edited by Howard P. Kennard, assisted by Netta Peacock. xx and 428 pp. The Macmillan Co., New York, 1912. 7½ x 5. [Special American edition. Considerably abridged from the English edition but containing ampler information regarding Russia's trade with the United States.]

POLAR

Deuxième Expédition Antarctique Française (1908-10.) Commandée par le Dr. Jean Charcot. Sciences naturelles: documents scientifiques. Gastropodes Prosobranches, Scaphopode et Pélécypodes. Par Éd. Lamy. Amphineures. Par Joh. Thiele. 34 pp. Map, ills. Annélides Polychètes. Par Ch. Gravier. 165 pp. Map, ills. Échinodermes (Astéries, Ophiures et Échinides). Par R. Koehler. 270 pp. Map, ills. Ouvrage publié sous les auspices du Min. de l' Instr. Pub. Masson et Cie, Paris, 1911-12. 11 x 9 each. [Description of the species collected between 62° and 70° S. Mainly remarkable for new Echinoderms and as showing geographical extension of certain forms of Antarctic deep sea fauna.]

EDUCATIONAL GEOGRAPHY

Man and the Earth. A simple reader in human geography. By J. W. Page. viii and 149 pp. Ills. MacDonald & Evans, London, 1912. 1s. 7½ x 5.

Business Geography. By J. Hamilton Birrell. 208 pp. Maps. Ralph Holland & Co., London, 1912. 1s. 6d. 7½ x 5. [An elementary exposition of the geographical facts implied in trade-returns, considered mainly with reference to the commerce of the British Isles.]

Testo Atlante di Geografia. Di Asunto Mori. Fascicolo 1, Geografia fisica generale; L'Europa e l'Italia in generale. Fascicolo 2, L'Italia—L'Europa. Fascicolo 3, Continenti extraeuropei. Ills., maps. Ditta G. B. Paravia e Comp., Torino. 1912. (?) 6½ x 10. [The last edition of this work contains new maps and illustrations. The nomenclature adopted is clear and appropriate. The text is enlivened by short descriptions of numerous localities from the pen of authors of repute.]

HISTORICAL GEOGRAPHY

La Colonizzazione Militare dei Romani. Di N. M. Campolieti. 23 pp. Extract, Rivista militare italiana, 1912. Enrico Voghera, Rome, 1912. 9½ x 6. [Discusses the social conditions in the Roman Empire which led to the founding of distant colonies.]

Columbus and his Predecessors. A Study in the Beginnings of American History. By Charles H. McCarthy. 223 pp. Index. John J. McVey, Philadelphia, 1912. 50 cents. 6 x 4½. [Résumé of the progress of discovery from the age of Eratosthenes to the discovery of America. Shows how the discovery of the New World was the culmination of a succession of historical events.]

GENERAL

Time and Tide, a Romance of the Moon. By Sir Robert S. Ball. 192 pp. Ill., index. Soc. for Promoting Christian Knowledge, London, 1909. 2s. 6d. 7 x 5. [Presents in a popular form, certain relations between the earth and its satellite.]

Sounding the Ocean of Air. Being 6 lectures delivered before the Lowell Institute, Boston in Dec., 1898. By A. Lawrence Rotch. viii and 184 pp. Ills., index. Soc. for Promoting Christian Knowledge, London, 1900. 2s. 6d. 7 x 5. [An introduction to the study of the atmosphere.]

B. G. Teubner's Verlagskatalog auf dem Gebiete der Mathematik Naturwissenschaften Technik nebst Grenzwissenschaften. Grosse (102.) Ausgabe, 1908-1912. lxxxvii and 231 pp. Ills. B. G. Teubner, Leipzig, 1912. 9 x 5½. [Contains a succinct résumé of the chief points of interest of each work catalogued. A valuable compilation.]

In Grembo al Mare. Di Jack la Bolina (A. V. Vecchi). 237 pp., ills. Nicola Zanichelli, Bologna. 1912. 4½ x 7. [An introduction to the study of oceanography. Written in popular style.]

The Railway Library and Statistics. 1911. [Third Series.] Compiled and edited by Slason Thompson. Chicago. The Gunthorp-Warren Printing Co. 1912. 8½ x 5½. [The Report of the Interstate R. R. Commission is included in this collection of noteworthy addresses and papers mostly delivered or published in 1911.]

FROM POLE TO POLE. A book for young people. By Sven Hedin. xv and 407 pp. Maps, ills. Macmillan Co., New York, 1912. \$2.50. 8 x 5½. [A translation and abridgment of "Von Pol zú Pol" which was noticed in the *Bull.,* Vol. 44, 1912. June, p. 468.]

VIEWS AND REVIEWS, from the outlook of an anthropologist. By Sir Harry Johnston. 314 pp. Williams & Norgate, London, 1912. 3s. 6d. 8 x 5½. [Replete with facts of geographical interest, although no topic is treated from the geographical standpoint.]

GUIDE BOOKS

HANDBOOK FOR TRAVELLERS IN IRELAND. 8th edition, revised and edited by John Cooke. x and 604 pp. Maps, index. Edward Stanford, London, 1912. 9s. 7 x 5. [This edition is revised, among other particulars, in the light of recent archæological investigations. Special attention devoted to the angling section. An informative guide on the new Ireland of our day.]

BERLIN AND ITS ENVIRONS. Handbook for Travellers. By Karl Baedeker. 5th edition. x and 254 pp. Maps, plans. K. Baedeker, Leipzig, 1912. Mks. 3. 6½ x 4½. [Includes in a much expanded and carefully revised form, information heretofore given in the Handbook for Northern Germany. It will help to render the traveler independent of guides. Excellent Maps and Plans.]

DAUPHINÉ. Guide rédigé par Maurice Paillon. Collection des Guides-Joanne. 588 pp. Maps, plans. Hachette et Cie, Paris, 1910. Fr. 10. 6½ x 4. [Fourth edition with maps redrawn. A number of sketch maps show the topography of the mountain sections. Information regarding slopes and their condition. Geological notes on the surface formations.]

SAVOIE. Guide revisé par Maurice Paillon. Collection des Guides-Joanne. 482 pp. Maps. Hachette et Cie, Paris, 1912. Fr. 7.50. 6½ x 4. [Informative regarding towns and holiday resorts especially with regard to the "Route des Alpes." Numerous maps.]

GUIDE AUX RUINES D'ANGKOR. Par J. Commaille. 241 pp. Ills., plans. Hachette et Cie, Paris, 1912. 8 frs. 7½ x 4½. [Detailed descriptions of the ruins.]

CURRENT GEOGRAPHICAL PAPERS

NORTH AMERICA

The Continent and Parts of It

HAGNAUER, W. G. Die Kaffee-Kultur in Guatemala und Mexiko. *Mitt. Ostschweizer. Geogr.-Comm. Gesell. St. Gallen,* 1912, No. 1, pp. 1-18.

United States

BAKER, C. L. Physiography and Structure of the Western El Paso Range and the Southern Sierra Nevada. *Univ. of Cal. Public., Bull. Dept. Geol.,* Vol. 7, 1912, No. 6, pp. 117-142. Berkeley.

CHAPMAN, H. H. Forest Fires and Forestry in the Southern States. Ills. *Amer. Forestr.,* Vol. 18, 1912, No. 8, pp. 510-517.

CLINTON, G., JR. Early History of the Erie Canal. Ills. *Natl. Waterways,* Vol. 1, 1912, No. 1, pp. 37-42. Washington.

COX, H. J. The Weather Bureau and the Cranberry Industry. Ills. Reprint, *Yearbook, Dept. of Agric.,* 1911, pp. 211-222.

FOHS, F. J. Coals of the Region Drained by the Quicksand Creeks in Breathitt, Floyd, and Knott Counties. 79 pp. Maps. *Bull. 18, Serial 25, Kentucky Geol. Surv.,* 1912.

GALE, H. S. Nitrate Deposits. 36 pp. Maps, ills. *Bull. 523, U. S. Geol. Surv.,* 1912.

GARDNER, J. H., AND S. C. JONES. Preliminary Report on the Economic Geology of the Hartford Quadrangle, and on Some Soils of the Same Quadrangle. 33 pp. Maps. *Bull. 20, Serial 27, Kentucky Geol. Surv.,* 1912.

Gaylord, F. A. Forestry and Forest Resources in New York. Ills. *Amer. Forestr.*, Vol. 18, 1912, No. 11, pp. 685-701.

Hidinger, L. L., and A. E. Morgan. Drainage Problems of Wolf, Hatchie and South Fork of Forked Deer Rivers, in West Tennessee. Maps. *Resources of Tennessee*, Vol. 2, 1912, No. 6, pp. 231-249. Nashville.

Hole, A. D. Glaciation in the Telluride Quadrangle, Colo. Map, ills. *Journ. of Geol.*, Vol. 20, 1912, No. 6, pp. 502-529.

Jamison, C. E. The Douglas Oil Field, Converse Co., Wyo. Maps, ills. *Bull. 3, Series B, Wyoming Geol. Surv.*, pp. 5-41. Cheyenne, 1912.

Jamison, C. E. The Muddy Creek Oil Field, Carbon Co., Wyo. Map, ill. *Bull. 3, Series B, Wyoming Geol. Surv.*, pp. 43-50. Cheyenne, 1912.

Laney, F. B., and K. H. Wood. Bibliography of North Carolina Geology, Mineralogy and Geography, with List of Maps. 428 pp. Index. *Bull. No. 18, Geol. and Econ. Surv.* Raleigh, 1909.

Lee, C. H. An Intensive Study of the Water Resources of a Part of Owens Valley, Cal., 135 pp. Maps, ills., index. *Water-Supply Paper 294, U. S. Geol. Surv.* 1912.

Levy, A. Recollections of a Pioneer Woman of La Crosse. Edited by A. H. Sanford. Ills. *Proc. State Hist. Soc. of Wis. 59 Ann. Meeting 1911*, pp. 201-215. Madison, 1912.

Matthes, F. E. Sketch of Yosemite National Park and Account of the Origin of the Yosemite and Hetch Hetchy Valleys. 47 pp. Map, ills. Supt. of Documents, Washington, D. C.

McGlashan, H. D., and H. J. Dean. Stream Measurements in San Joaquin River Basin. Part 2 of Water Resources of California. 439 pp. Map, ills., index. *Water-Supply Paper 299, U. S. Geol. Surv.*, 1912.

Merrill, G. P. A Recent Meteorite Fall near Holbrook, Navajo Co., Ariz. 4 pp. *Smithson, Miscell. Coll.*, Vol. 60, 1912, No. 9.

Mumford, H. W., and L. D. Hall. Relation of the U. S. to the World's Beef Supply. *Circ. No. 163, Agric. Exper. Station, Univ. of Ill.* Urbana, 1912.

Newland, D. H. Mining and Quarry Industry of New York State. Report of Operations and Production during 1911. 114 pp. Index. *New York State Mus. Bull. 161.* Albany, 1912.

Porter, V. M. Gen. Stephen W. Kearny and the Conquest of California (1846-7). Ills. *Ann. Public. Hist. Soc. Southern Cal.*, 1909-10. Los Angeles, 1911.

Pratt, J. H. Proceedings of the Annual Convention of the N. C. Good Roads Assoc., Held at Charlotte, N. C., Aug. 1-2, 1912, in Cooperation with N. C. Geol. and Econ. Surv. 110 pp. *Econ. Paper 30, North Carolina Geol. and Econ. Surv.* Raleigh.

Pratt, J. H. Report of the Fisheries Convention Held at New Bern, N. C., Dec. 13, 1911. 302 pp. *Econ. Paper 29, N. C. Geol. and Econ. Surv.* Raleigh, 1912.

Pratt, J. H., and H. M. Berry. Highway Work in North Carolina, Containing a Statistical Report of Road Work during 1911. 145 pp. Ills. *Econ. Paper No. 27, N. C. Geol. and Econ. Surv.* Raleigh, 1912.

Shannon, C. W. Results of Glaciation in Indiana. Ills. *Proc. Indiana Acad. of Sci.*, 1911, pp. 173-196. Indianapolis, 1912.

Spahr, Dr. Die Zuckerrohr-, Baumwoll- und Reiskultur in Louisiana. *Tropenpflanzer*, Vol. 16, 1912, No. 10, pp. 517-526, No. 11, pp. 591-607, No. 12, pp. 633-645.

Sudworth, G. B. Present Condition of the California Big Trees. Ills. *Amer. Mus. Journ.*, Vol. 12, 1912, No. 7, pp. 227-236.

Thwaites, F. T. Sandstones of the Wisconsin Coast of Lake Superior. 117 pp. Maps, ills., index. *Wis. Geol. and Nat. Hist. Surv., Bull. No. 25, Sci. Series No. 8.* Madison, 1912.

—— Agriculture. Statistics for the State and its Counties. Abstracts—Farms and Farm Property, General Farm Crops, Live Stock on Farms and Elsewhere. *Bulletins of the 13th Census of the U. S. 1910, Bur. of Census:*

Maine, 22 pp.; Massachusetts, 22 pp.; New Hampshire, 22 pp.; Rhode Island, 19 pp.; United States, 34 pp., 20 pp., 28 pp.; maps; Vermont, 22 pp.

—— Ann. Rept. of the Commissioner of Fisheries to the Secr. of Comm. and Labor for Year ended June 30, 1911. 69 pp. 1912.

—— Foreign Commerce and Navigation of the U. S. for Year ending June 30, 1911. 1263 pp. Index. *Bur. of Statistics, Dept. Comm. and Labor.* 1912.

—— Handling of Iron Ore on the Great Lakes. Ills. *Natl. Waterways,* Vol. 1, 1912, No. 1, pp. 11-14. Washington.

—— How to Protect and Perpetuate the Fishing Industries of North Carolina. 6 pp. *Press Bull. 96, N. C. Geol. and Econ. Surv.,* Chapel Hill, 1912.

—— Proceedings, Mass. Historical Society, Oct. 1911-June 1912. Vol. 45. 693 pp. Index, ills. Boston.

Bermuda

FLEURY, E. L'évolution géologique des Bermudes. *La Géogr.,* Vol. 24, 1912, No. 6, pp. 394-398.

Canada

COVERT, C. C., AND R. H. BOLSTER. St. Lawrence River Basin. Part 4 of Surface Water Supply of the U. S. 98 pp. Map, ills., index. *Water-Supply Paper 304, U. S. Geol. Surv.,* 1912.

COVERT, C. C., A. H. HORTON AND R. H. BOLSTER. St. Lawrence River Basin. Part 4 of Surface Water Supply of the U. S. 125 pp. ills. *Water-Supply Paper 284, U. S. Geol. Surv.,* 1912.

STUPART, R. F. Climate of Northern Ontario. *Trans. Canad. Inst.,* Vol. 9, 1912, Part 2, No. 21, pp. 149-152. Toronto.

WILSON, E. Paper Mills and Forestry in Canada. Ills. *Amer. Forestry,* Vol. 18, 1912, No. 12, pp. 769-776.

—— A Federal Bureau of Geography for Canada. *Geogr. Journ.,* Vol. 40, 1912, No. 6, pp. 620-621.

—— Saint-Pierre et Miquelon. *Statist. du Comm. des Colon. Françaises,* 1910, Vol. 5, pp. 11-79. Office Colonial, Paris, 1912.

Mexico

GONZALEZ, P. A. Situacion, extension, y límites del Estado de Tabasco. *Bol. Soc. Mexicana de Geogr. y Estad.,* Vol. 5, 1912, No. 9, pp. 467-481. Mexico.

CENTRAL AMERICA AND WEST INDIES

Cuba

MAGOON, C. E. Republic of Cuba. Report of Provisional Administration from Oct. 13, 1906 to Dec. 1, 1907. 557 pp. Ills. *Pan Amer. Union.* Washington.

Jamaica

CORNISH, V. On the Cause of the Jamaica Earthquake of Jan. 14, 1907. Map. *Geogr. Journ.,* Vol. 40, 1912, No. 3, pp. 299-303.

Panama Canal Zone

CORNISH, V. The Panama Canal and its Relation to the British Empire. Map. *United Empire,* Vol. 3, 1912, No. 8, pp. 652-661.

—— Ann. Rept. of the Isthmian Canal Commission for Fiscal Year ending June 30, 1911. 581 pp. Map, ills. Washington.

SOUTH AMERICA

The Continent and Parts of It

CAMPBELL, D. H. Some Impressions of the Flora of Guiana and Trinidad. Ills. *Pop. Sci. Monthly,* Vol. 82, 1913, No. 1, pp. 19-32.

DARBENE, R. Los indígenas de la Tierra del Fuego. Ills., bibl. *Bol. Inst. Geogr. Argentino,* Vol. 25, 1911, Nos. 5-6, pp. 163-226, Nos. 7-8, pp. 247-300.

NORDENSKIÖLD, E. Une Contribution à la Connaissance de l'Anthropogéographie de l'Amérique. *Journ. Soc. des Américanist. de Paris,* Vol. 9, 1912, Fasc. 1, pp. 19-25.

SMITH, R. A Visit to Patagonia. Ills. *Scott. Geogr. Mag.,* Vol. 28, 1912, No. 9, pp. 456-475.

Argentina

Mumford, H. W. Argentina as a Factor in International Beef Trade. Map, ills. *Circ. No. 164, Agric. Exper. Station, Univ. of Illinois,* Urbana, 1912.

Bolivia

Créqui-Montfort, G. de, et P. Rivet. Linguistique Bolivienne: Le Groupe Otukè. Reprint, *Journ. Soc. des Américanist. de Paris,* Vol. 9, 1912, pp. 317-337.

Brazil

Belfort Mattos, J. N. Dados Climatologicos do Anno de 1910. 45 pp. Maps, tables, ills. *Servic. Meteor.,* Serie 2, 1910, Nos. 17-20, *Secretaria da Agric., Comm. e Obras Publicas,* São Paulo. 1912.

Chile

—— Anuario Estadístico de la República de Chile, 1910. Vol. 2, Movimiento de Poblacion. Part 2, Defunciones. 758 pp. Vol. 3, Casa de Moneda, Hacienda Pública, Comunicaciones, Comercio, Bancos, Cambio bancario, Ahorros, Casas de Préstamos. 635 pp. *Ofic. Central de Estad.,* Santiago, 1912.

Peru

Bowman, I. A Buried Wall at Cuzco and Its Relation to the Question of a pre-Inca Race (Yale-Peruvian Expedition, 1911). Ills. *Amer. Journ. of Sci.,* Vol. 34, 1912, No. 204, pp. 497-509.

—— Agriculture and Irrigation in the Valley of Ica. Ills. *Peru To-Day,* Vol. 4, 1912, No. 9, pp. 481-490.

—— The North-Western Railway and Huacho. Ills. *Peru To-day,* Vol. 4, 1912, No. 9, pp. 490-492.

Uruguay

—— Anuario Estadístico de la República Oriental del Uruguay. Tomo II, Parte III. Censo general de la República en 1908. 1254 pp. Dirrección Gen. de Estad. Montevideo, 1911.

AFRICA

The Continent and Parts of It

Avelot, R. Une Exploration Oubliée: Voyage de Jan de Herder au Kwango (1642). Maps, ills. *La Géogr.,* Vol. 26, 1912, No.5, pp. 319-328.

—— Comment les eaux de l'ancien lac Kivu s'écoulent dans le Tanganika. Map. *Mouv. Géogr.,* Vol. 29, 1912, No. 17, cols. 265-267.

—— Colonies de l'Afrique occidentale et équatoriale. Tome 2: Statist. du Commerce des Colon. françaises, 1910. 627 pp. *Office Colonial, Minist. des Colon.* Paris, 1912.

—— Meteorologische Beobachtungen aus dem Grenzgebiet von Kamerun und Spanisch-Guinea. *Mitt. Deutschen Schutzgeb.,* Vol. 25, 1912, No. 2, pp. 77-78.

—— Zur Karte des Deutsch-portugiesischen Grenzgebiets in Südwestafrika. Map. *Mitt. Deutschen Schutzgebieten,* Vol. 25, 1912, No. 4, pp. 330-331.

Belgian Congo

—— Bibliographie. Livres et Ouvrages en Fascicules. *Rev. Congolaise,* Vol. 3, 1912, No. 1, pp. 63-80.

—— Comité Spécial du Katanga. Rapport Annuel de M. H. Droogmans. Map. *Mouv. Géogr.,* Vol. 29, 1912, No. 47, cols. 630-639.

—— La main-d'œuvre indigène au Katanga. *Mouv. Géogr.,* Vol. 29, 1912, No. 42, cols. 572-575.

British East Africa

Champion, A. M. The Thowa River. Map, ills. *Journ. East Afric. and Uganda Nat. Hist. Soc.,* Vol. 3, 1912, No. 5, pp. 13-20.

Hobley, C. W. Early Man in British East Africa. Ills. *Journ. East Africa and Uganda Nat. Hist. Soc.,* Vol. 3, 1912, No. 5, pp. 20-27.

Hobley, C. W. The Snakes of British East Africa. Ills. *Journ. East Africa and Uganda Nat. Hist. Soc.,* Vol. 3, 1912, No. 5, pp. 43-56.

French Equatorial Africa

MORNET, J. Le chemin de fer de l'océan à Brazzaville. Map. *Renseign. Col.*, No. 11, pp. 393-399. Suppl. *l'Afrique Franç.*, Vol. 22, 1912, No. 11.

—— Le Gabon. Souvenir d'une Campagne faite en 1872, par le capitaine de vaisseau Coffinières de Nordeck. *Bull. Soc. Géogr. de Rocheford,* Vol. 33, 1911, No. 3, pp. 124-158, No. 4, pp. 181-202, Vol. 34, 1912, No. 1, pp. 22-35, No. 2, pp. 73-98.

German East Africa

HEIDKE, P. Meteorologische Beobachtungen in Deutsch-Ostafrika. Teil 7: Zusammenstellung der Monats- und Jahresmittel aus dem Jahre 1910 an 49 Beobachtungsstationen. *Mitt. Deutschen Schutzgeb.*, Vol. 25, 1912, No. 2, pp. 103-175.

—— Ufipa—Land und Leute. Ergebnisse einer in den Jahren 1908 und 1909 ausgeführten Forschungsreise. Map, ills., *Mitt. Deutschen Schutzgeb.*, Vol. 25, 1912, No. 2, pp. 79-101.

German Southwest Africa

—— Jahresbericht über das meteorologische Beobachtungswesen im südwestafrikanischen Schutzgebiet für die Zeit vom 1. Juli 1910 bis 30. Juni 1911. Map. *Mitt. Deutschen Schutzgeb.*, Vol. 25, 1912, No. 1, pp. 56-71.

Kamerun

HUTTER, F. Neu-Kamerun. Maps, ills. *Geogr. Zeitschr.*, Vol. 18, 1912, No. 10, pp. 545-566, No. 11, pp. 625-641.

KOCH, E. Das Zwergvolk der Bagielli. Ills. *Deutsche Kolonialzeit.*, Vol. 48, 1912, No. 48, p. 810.

LEDERMANN, C. Eine botanische Wanderung nach Deutsch-Adamaua. Map. *Mitt. Deutschen Schutzgeb.*, Vol. 25, 1912, No. 1, pp. 20-55.

MARQUARDSEN, H. Bericht über das meteorologische Beobachtungswesen in Kamerun im Jahre 1911. Map. *Mitt. Deutschen Schutzgebieten,* Vol. 25, 1912, No. 4, pp. 319-330.

MARTIN, C. Cameroun. *L'Afrique Franç.*, Vol. 22, 1912, No. 10, pp. 419-420.

STRÜMPELL, K. Forschungen am Nordrande des Kamerunplateaus. Map. *Mitt. Deutschen Schutzgeb.*, Vol. 25, 1912, No. 1, pp. 1-16.

—— Höhenmessungen des Hauptmanns K. Strümpell. *Mitt. Deutschen Schutzgeb.*, Vol. 25, 1912, No. 1, pp. 16-18.

Morocco

SAINT-HILAIRE, H. G. L'élevage au Maroc. Rapport au Comité du Maroc. Ills. *Renseign. Colon.*, No. 12, pp. 428-444. Suppl. *l'Afrique Franç.*, Vol. 22, 1912, No. 12.

—— L'Aube du Protectorat Marocain. Map. *L'Afrique Franç.*, Vol. 22, 1912, No. 12, pp. 472-487.

Sahara

CHARLET, CAPT. L'Oasis de Djanet. Son occupation par la Compagnie Saharienne du Tidikelt. Map. *Bull. Soc. Géogr. d'Alger et de l'Afrique du Nord,* Vol. 17, 1912, 2e Trim., pp. 129-147.

CHUDEAU, R. Mission d'Études des Chemins de fer Transafricains. Map. *Bull. Soc. Géogr. Comm. de Paris,* Vol. 34, 1912, No. 10, pp. 625-630.

CORNETZ. Le tracé de l'Oued el Djenneinen. *Bull. Soc. de Géogr. d'Alger et de l'Afrique du Nord,* Vol. 16, 1911, 2e Trim., pp. 154-160.

CORTIER, M. Les salines du Sahara soudanais. *La Géogr.*, Vol. 25, 1912, No. 2, pp. 91-98.

Togo

GAISSER, K. Die Produktion der Eingeborenen des Bezirkes Sokode—Bassari. *Mitt. Deutschen Schutzgeb,* Vol. 25, 1912, No. 4, pp. 239-318.

HEIDKE, P. Meteorologische Beobachtungen aus Togo. *Mitt. Deutschen Schutzgeb.*, Vol. 25, 1912, No. 3, pp. 187-213.

—— Ergebnisse der Regenmessungen im Schutzgebiete Togo im Jahre 1911. *Mitt. Deutschen Schutzgeb.*, Vol. 25, 1912, No. 3, pp. 213-214.

Tripoli

Bossi, A. In Libia. Impressioni di Viaggio. 48 pp. A. Cordani, Milan, 1912.

—— A Recent Journey in Tripoli and Cyrenaica. Map. *Geogr. Journ.*, Vol. 40, 1912, No. 5, pp. 532-537.

ASIA

China and Its Dependencies

Pelliot, P. En Asie Centrale. *Bull. Soc. normande de Géogr.*, Vol 33, 1911, 1er Trim., pp. 1-26.

Pontus, R. La Transcription des Sons Chinois. *Bull. Soc. Roy. Belge de Géogr.*, Vol. 36, 1912, No. 3, pp. 203-218.

Wessels, C. Bento de Goes, S. J.: Een Ondekkingsreiziger in Centraal-Azie (1603-1607). [A Portuguese traveler whose journeys in Asia proved that Cathay and China were one and the same country.] Ill. *Studien, Tijdschr. Godsdienst, Wetenschap en Lettern*, Vol. 43, Deel 75, Afl. 1, pp. 72-96, Afl. 2, pp. 229-248. Antwerp, 1912?

—— Commercial Importance of Harbin (Manchuria). *Board of Trade Journ.*, Vol. 79, 1912, No. 836, pp. 500-501.

—— Fahrten auf dem oberen Yangtse. *Ann. Hydrogr. und Mar. Met.*, Vol. 40, 1912, No. 11, pp. 619-622.

—— Returns of Trade and Trade Reports, 1911. Part 3 (Analysis of Foreign Trade), Vol. 2: Exports, pp. 328-500. Shanghai, 1912.

Dutch East Indies

Bernard, C. La culture du Thé à Java. *Le Globe*, organe *Soc. Géogr. Genève*, Vol. 51, 1912, pp. 1-31.

Niermeyer, J. F. Atollen en Barriere-Riffen in de Oost-Indiese Archipel. Aen Antwoord, en een Opwekking tot Onderzoek. *Tijdschr. Kon. Nederl. Aardrijksk. Genoot.*, Tweede Serie, Deel 29, 1912, No. 5, pp. 623-636.

Simon, S. V. Studien über den Reisbau auf Java. Ills. *Tropenpflanzer*, Vol. 16, 1912, No. 9, pp. 459-484, No. 10, pp. 527-542, No. 11, pp. 581-591, No. 12, pp. 645-660.

Witkamp, H. Een verkenningstocht over het eiland Soemba. Map, ills. *Tijdschr. Kon. Nederl. Aardrijksk. Genoot.*, Tweede Serie, Deel 29, 1912, No. 6, pp. 744-775.

India

Workman, F. B. Some Notes on my 1912 Expedition to the Siachen or Rose Glacier. *Geogr. Journ.*, Vol. 40, 1912, No. 6, pp. 615-620.

—— Établissements français dans l'Inde. *Statist. du Comm. des Colon. Françaises*, 1910, Vol. 4, pp. 11-57. Office Colonial, Paris, 1912.

Japanese Empire

Chamberlain, A. F. The Japanese Race. *Journ. of Race Development*, Vol. 3, 1912, No. 2, pp. 176-187. Worcester, Mass.

Hayata, B. Icones of the Plants of Formosa, and Materials for a Flora of the Island, based on a Study of the Collections of the Botanical Survey of Formosa. 265 pp. Ills., index. *Bur. of Productive Industry*, Fasc. 1, 1911, Govt. of Formosa, Taihoku.

Iyenaga, T. Japan's Annexation of Korea. *Journ. of Race Development*, Vol. 3, 1912, No. 2, pp. 201-223. Worcester, Mass.

Kanehira, R. Forestry in Formosa. Ills. *Amer. Forestr.*, Vol. 18, 1912, No. 8, pp. 492.

Salwey, C. M. The Kuril Islands, called by the Japanese Chishima. *Imp. and Asiatic Quart. Rev.*, Vol. 34, 1912, No. 68, pp. 363-383.

Semple, E. C. Influence of Geographical Conditions upon Japanese Agriculture. Map, ills. *Geogr. Journ.*, Vol. 40, 1912, No. 6, pp. 589-607.

Torii, R. Les Aborigènes de Formose. 75 pp. Maps, ills. *Journ. Coll. of Sci. Imp. Univ. Tokyo*, Vol. 32, 1912.

Yanagisawa, Y. Histoire critique des travaux statistiques au Japon depuis l'antiquité jusqu'à la restauration impériale. *Bull. l'Inst. Intern. de Statist.*, Vol. 19, Livr. 3, pp. 245-307. The Hague, 1912.

Turkey in Asia

DESCHAMPS, É. Smyrne, la ville d'Homère. Map. *Bull. Soc. Géogr. et d'Études Colon. de Marseille,* Vol. 36, 1912, No. 2, Trim 2, pp. 151-178.

LYONS, H. G. Sir William Willcocks's Survey in Mesopotamia. Map. *Geogr. Journ.,* Vol. 40, 1912, No. 5, pp. 501-503.

WILLCOCKS, W. The Garden of Eden and Its Restoration. [Mesopotamia.] Map, ills. *Geogr. Journ.,* Vol. 40, 1912, No. 2, pp. 129-148.

Philippine Islands

CORONAS, J. The extraordinary Drought in the Philippines, Oct. 1911 to May 1912. 19 pp. *Weather Bur., Dept. Interior.* Manila, 1912.

MARTIN, A. Les Iles Philippines. *Bull. Soc. Géogr. Comm., Paris,* Vol. 34, 1912, No. 9, pp. 561-600, No. 10, pp. 630-660, No. 11, pp. 705-728.

—— Ann. Rept. of the Director of the Weather Bureau for 1909. Part I: Administrative Rept. II: Hourly Meteorological Observations at the Central Observatory. 174 pp. *Weather Bur., Dept. of Interior.* Manila, 1912.

AUSTRALASIA AND OCEANIA

Bismarck Archipelago

RIBBE, C. Ein Sammelaufenthalt in Neu-Lauenburg. Ills. *Mitt. Vereins für Erdk. zu Dresden,* Vol. 2, No. 2-5, pp. 75-150, 163-222, 273-384, 391-492. 1910-12.

SCHLAGINHAUFEN, O. Ein anthropologischer Querschnitt im Südosten von Neu-Mecklenburg. 4 pp. Map, diagrams. Reprint. *Korrespond.-Blatt Deutschen Gesell. für Anthrop., Ethnol. und Urgeschichte,* Vol. 41, 1910, No. 9-12.

Dutch New Guinea

VAN DER VEN, F. F. De Wildeman-Rivier. Map. *Tijdschr. Kon. Nederl. Aardrijksk. Genoot.,* Tweede Serie, Deel 29, 1912, No. 3, pp. 310-315.

—— De exploratie van Nieuw-Guinea. Maps. *Tijdschr. Kon. Nederl. Aardrijksk. Genoot.,* Tweede Serie, Deel 29, 1912, No. 6, pp. 834-841.

Kaiser Wilhelm Land

MARQUARDSEN, H. Bericht über das meteorologische Beobachtungswesen im Schutzgebiet Deutsch-Neuguinea im Jahre 1911. *Mitt. Deutschen Schutzgebieten,* Vol. 25, 1912, No. 4, pp. 332-337.

SCHULTZE, L. Deutsche Grenzexpedition in das Kaiser-Wilhelmsland. Map. *Mitt. Gesell. für Erdk. Leipzig,* 1911, pp. 23-35.

—— Gesamthandel des Schutzgebiets Neuguinea einschliesslich des Inselgebiets von 1900 bis 1910. *Tropenpflanzer,* Vol. 16, 1912, No. 2, p. 90.

—— Bericht über die Arbeiten des Hauptmanns Foerster bei Gelegenheit der Grenzfestsetzung von Kaiser-Wilhelmsland im Verlauf des 8. Grades südlicher Breite. Map. *Mitt. Deutschen Schutzgeb.,* Vol. 25, 1912, No. 1, pp. 72-74.

Melanesia

RIVERS, W. H. R. Island-Names in Melanesia. Map. *Geogr. Journ.,* Vol. 39, 1912, No. 5, pp. 458-468.

New Zealand

COTTON, C. A. Recent and Sub-recent Movements of Uplift and of Subsidence near Wellington, N. Z. Map, ills. Reprint, *Scott. Geogr. Mag.,* Vol. 28, 1912, June, pp. 306-312.

MARSHALL, P., R. SPEIGHT AND C. A. COTTON. Younger Rock Series of New Zealand. Map, ills. Reprint, *Trans. New Zealand Inst.,* Vol. 43, 1910, pp. 378-407.

STRAUCHON, J. Report of the Dept. of Lands and Survey, New Zealand, 1911-12. 72 pp. Maps, ills. Wellington.

—— Transactions and Proceeding of the New Zealand Institute 1911. Vol. 44, 460 pp. Maps, ills. Wellington, 1912.

Hawaiian Islands

DILL, H. R., AND W. A. BRYAN. Report of an Expedition to Laysan Island in 1911. [Hawaiian Bird Reservation.] 30 pp. Ills. *Bull. No. 42, Biol. Surv.,* U. S. Dept. of Agric. 1912.

HAZARD, D. Results of Observations made at the Coast and Geodetic Survey Magnetic Observatory near Honolulu, Hawaii, 1909 and 1910. 95 pp. Diagrams. *Coast and Geod. Surv.* 1912.

—— Manufactures: Hawaii. Statistics of Manufactures for the Territory, Cities and Industries. 15 pp. *Bull. Thirteenth Census of the U. S.:* 1910, Bur. of the Census.

EUROPE

The Continent and Parts of It

BRÜCKNER, E. Die dritte Terminfahrt S. M. S. *Najade* in der Hochsee der Adria vom 16. Aug. bis 5. Sept. 1911. Map, ills., diagrams. *Mitt. k. k. Geogr. Gesell. in Wien,* Vol. 55, 1912, Nos. 1 and 2, pp. 5-39.

ROHRBACH, P. Die strategischen Passagen und Engen des Mittelmeers. *Geogr. Zeitschr.,* Vol. 18, 1912, No. 2, pp. 65-79.

STOK, J. P. VAN DER. Das Klima des südöstlichen Teiles der Nordsee, unweit der niederländischen Küste. 112 pp. *Mededeel. en Verhandel. Kon. Nederl. Met. Inst.,* No. 102. Utrecht, 1912.

WITTING, R. Zusammenfassende Übersicht der Hydrographie des Bottnischen und Finnischen Meerbusens und der nördlichen Ostsee nach den Untersuchungen bis Ende 1910. 82 pp. Maps, ills. *Finländ. Hydrogr.-Biol. Untersuch.,* No. 7, Helsingfors, 1912.

Austria

D'ALIA, A. La Dalmazia. 116 pp. *Boll. Minist. degli Affari Esteri,* Nov., 1912. Rome.

HAYEK, A. von. Die pflanzengeographische Literatur Österreichs in den Jahren 1897-1909. *Geogr. Jahresbericht aus Österreich,* Vol. 9, 1911, pp. 95-121.

MACHATSCHEK, F. Die landeskundliche Literatur der österreichischen Alpenländer in den Jahren 1906-10. *Geogr. Jahresbericht aus Österreich,* Vol. 9, 1911, pp. 1-37. Wien.

MAYER, J. Der Mürzgau. Eine historisch-geographische Studie. Map, ills. *Deutsche Rundschau für Geogr.,* Vol. 35, 1912-13, No. 1, pp. 25-29, No. 2, pp. 49-62.

Denmark

KÜCHLER, C. Land und leute der Faeröer. Map. *Geogr. Zeitschr.,* Vol. 17, 1911, No. 11, pp. 601-618.

France

LAFFITTE, L. L'évolution économique de la Lorraine. *Ann. de Géogr.,* Vol. 21, 1912, No. 120, pp. 393-417.

LEVAINVILLE, J. Les transformations du Port du Havre. *Ann. de Géogr.,* Vol 21, 1912, No. 120, pp. 455-458.

MILLER, W. H. The Forestry of France. Ills. *Amer. Forestr.,* Vol. 18, 1912, No. 8, pp. 493-500.

WELSCH, J. Hydrologie Souterraine du Poitou Calcaire. 65 pp. Ills. *Spelunca, Bull. Soc. Spéléologie,* Vol. 9, 1912, No. 69. Paris.

—— Le commerce de la France avec ses colonies. *Renseign. Colon.,* No. 12, pp. 462-463. Suppl. *l'Afrique Franç.,* Vol. 22, 1912, No. 12.

French Colonies

—— Statistiques générales des colonies françaises pour l'année 1910. Rapports sur le commerce. Tome 1: Statist. du Comm. des Colon. franç. pour l'Année 1910. 437 pp. *Minist. des Colonies, Office Col.,* Paris, 1912.

—— Statistiques de l'Industrie Minière dans les Colonies Françaises pendant l'Année 1909. 150 pp.; 1910, 193 pp. *Minist. des Colonies, Office Colonial,* Paris, 1911.

Germany

Riedel, J. Entwicklung der Verkehrsstrassen von Leipzig bis ins 18. Jahrhundert. Map. *Mitt. Vereins der Geographen, Univ. Leipzig,* No. 2, pp. 51-62. 1911.

Rudolphi, H. Das Stadtbild Leipzigs geographisch betrachtet. *Mitt. Vereins der Geographen, Univ. Leipzig,* No. 1, pp. 14-35. 1911.

—— Prof. Penck on the Sites of German Cities. *Geogr. Journ.,* Vol. 40, 1912, No. 6, pp. 628-631.

Hungary

Cholnoky, E. de. Le Groupement des montagnes de la Hongrie. *Bull. Hungarian Geogr. Soc.,* Intern. Edition, Vol. 38, 1910. Livr. 1-5, pp. 133-141. Budapest.

Kröhn, W. Beiträge zur Verkehrsgeographie von Krain unter besonderer Berücksichtigung der Zugänge. Inaug. Dissert. Albertus-Univ., Königsberg, 1911.

Sawicki, L. Les études glaciaires dans les Karpates. (Aperçu historique et critique). *Ann. de Géogr.,* Vol. 21, 1912, No. 117, pp. 230-250. [Also reprint.]

The Netherlands

—— Bulletin de l'Institut international de Statistique. Vol. 19, 1re Livr., 442 pp., 2e Livr., 475 pp.; supplement, 116 pp. The Hague, 1912.

Portugal

—— Associação Commercial do Porto. Relatorio da Direcção no Anno de 1911. 143 pp. 24 tables. Oporto, 1912.

—— Service Météorologique des Açores. Résumé d'Observations de 1911. 19 pp. Lisbon, 1912.

Rumania

Maior, O. Die Salzböden Rumäniens und ihre Urbarmachung. Dissertation. 101 pp. Reprint, *Kühn-Archiv,* Vol. 1, 1911, 2. Halbband. Halle a. S., 1911.

Russia

Paczoski, J. Sketch of Development of the Flora of Southwestern Russia. [In Russian.] 430 pp. Map, bibl., index. Suppl., *Zapiski* of the *Novorossyisk Nat. Hist. Soc.,* Vol. 34, 1910. Kherson

Rottman, H. Der Plan einer russischen Eisenbahn am Schwarzen Meer. Map. *Geogr. Zeitschr.,* Vol. 18, 1912, No. 11, pp. 615-624.

—— Geographical and Mineralogical Annual of Russia. [In Russian.] Vol. 14, 1912. Livr. 2, pp. 25-60, Livr. 3, pp. 61-102, Livr. 4-5, pp. 105-158. Novo-Alexandria.

Turkey in Europe

Kuchinka, G. Nordalbanien. Map. *Deutsche Rundschau für Geogr.* Vol. 35, 1912-1913, No. 1, pp. 1-10.

ANTHROPOGEOGRAPHY

Haberlandt, A. Die Trinkwasserversorgung primitiver Völker. Mit besonderer Berücksichtigung der Trockengebiete der Erde. 57 pp. *Ergänzungsheft No. 174, Pet. Mitt.,* 1912.

Laveleye, M. de. Discussion de la question du régime monétaire dans les Colonies. *Compte Rendu, Session tenue à Bruxelles,* les 29-31 Juillet, 1912, pp. 129-182. Inst. Colon. Intern., Brussels.

—— De l'acclimatement de la race blanche en pays tropicaux. *Compte Rendu, Session tenue à Bruxelles,* 29-31 Juillet, 1912, pp. 84-128. Inst. Colon. Intern., Paris.

ECONOMIC GEOGRAPHY

Chodat, R. A Grain of Wheat. *Pop. Sci. Monthly,* Vol. 82, 1913, No. 1, pp. 33-45.

Church, J. E., Jr. Conservation of Snow: Its Dependence on Mountains and Forests. *Offic. Bull. Intern. Irrig. Congress,* Vol. 1, 1912, No. 6, pp. 45-47, 50-52. Salt Lake City, Utah.

PINCHOT, G. Forestry, a Fundamental Industry. Ills. *Natl. Waterways*, Vol. 1, 1912, No. 1, pp. 57-59. Washington, D. C.

—— Welternte und Weltverbrauch von Kakao. *Tropenpflanzer*, Vol. 16, 1912, No. 12, pp. 673-675.

PHYSICAL GEOGRAPHY

BRUCE, W. S. The Prince of Monaco and Oceanographical Research. Ills. Reprint, *Scott. Geogr. Mag.*, Vol. 27, March, 1911, pp. 142-146.

KLOTZ, O. Earthquake Epicenters. Reprint, *Bull. Seismolog. Soc.*, Oct. 2, 1911, pp. 143-148.

KLOTZ, O. Location of Epicenters for 1911. Reprint, *Journ. Roy. Astron. Soc. of Canada*, Jan.-Feb., 1912, pp. 15-23. Ottawa.

RUTHVEN, J. F. Rival Tidal Theories. 30 pp. Reprint. *Nautical Press*, Glasgow. 1912.

—— The Meteorological Service. *Proc. and Trans. Roy. Soc. of Canada*, 3d Series, Vol. 5, 1911, pp. lvii-lxiii. Toronto, 1912.

GENERAL

LANGLEY, S. P., AND C. M. MANLY. Langley Memoir on Mechanical Flight. 320 pp. Ills., index. *Smiths. Contr. to Knowledge*, (Publ. 1948), Vol. 27, 1911, No. 3.

ROUILLARD, E. Nomenclature Géographique. *Bull. Soc. Géogr. de Québec*, Vol. 6, 1912, No. 4, pp. 231-234.

WAGNER, P. Der Gang des geographischen Unterrichts auf der Unterstufe höherer Schulen. *Geogr. Zeitschr.*, Vol. 18, 1912, No. 3, pp. 153-162.

NEW MAPS

EDITED BY THE ASSISTANT EDITOR

For system of listing maps see p. 75 of this volume

NORTH AMERICA

UNITED STATES-CANADA-MEXICO. Orographical Reduced Survey Map of the United States and Part of Canada. By J. G. Bartholomew, LL.D., F. R. G. S. 1:5,000,000. 58½° - 24½° N.; 134° - 55° W. 11 colors. With two insets: (1) [Approaches to Vancouver, B. C. 1:2,600,000. 49°40′ - 48°0′ N.; 125° - 122° W.] 3 colors. (2) [Environs of San Francisco. 1:1,200,000. 38°15′ - 37°20′ N.; 123°0′ - 121°40′ W.] 3 colors. John Bartholomew & Co. (The Edinburgh Geographical Institute), 1912. Price, dissected and mounted on cloth, 5s.

[This map will take high rank among general maps of the United States. Although on a smaller scale than the six-sheet map in Stieler's Atlas it is on the same scale as the four-sheet maps in the Atlas Universel de Géographie (Vivien de St. Martin) and Andree's Atlas which are in many respects now superior to that one-time masterpiece of Petermann. The chief value of this map, however, lies in its being a hypsometrical map. Of maps of this type it may well lay claim to being considered the best, for, of comparable maps, the relief map published by the U. S. Geological Survey is on a smaller scale, viz. 1:7,000,000, while of the standard contour map of the United States on the scale of 1:2,500,000, published by the same organization, no new edition has appeared since 1898.

Relief is represented in nine colors ranging from olive green to dark brown through the color scale made familiar by the excellent similar publications of the Edinburgh Geographical Institute. These colors represent elevations each between the contours 0, 100, 500, 1,000, 2,000, 3,000, 4,000, 5,000, 10,000 feet; there are additional contours between 5,000 and 10,000 feet which are not brought out by colors. The contours seem in the main to be based on the

large contour map of the United States referred to. Not always has the newer material been consulted, such as the contour map of Texas and eastern New Mexico, 1:1,584,000, by R. T. Hill (U. S. G. S. Topographic Folio No. 3; also separately) or the contour map of the Indian Territory, 1:500,000, by C. H. Fitch, also published by the Survey. Furthermore, the perpetuation, on so new a map, of the exaggerated height of Mt. Hooker in the Canadian Rockies (52½° N. and 118° W.)—a myth long ago dispelled by A. P. Coleman's trip *(cf. Geogr. Journ.,* Vol. 5, 1895, p. 859)—especially in juxtaposition with the proper altitude of Mt. Brown, is to be regretted.

Railroads are shown in black, the value of this feature being enhanced by distinction between principal and subsidiary lines. The symbol for the latter category, however, is so thin a hair-line that, in the West, it risks being confused with contours. A somewhat heavier line, such as used for the minor railroads of Mexico on the same map, would have been preferable. Here again, the selection of the principal railroad lines has not always been critical, as, for instance, in Florida where the line having its outlet at Cedar Keys is shown as a main line, while no line leading to the far more important port of Tampa is so designated.

In spite of these minor blemishes the map is a great improvement on its previous edition of 1905 without hypsometrical coloring and can well serve the purpose of a general map for scientific travelers, the lack of which Prof. Penck decried in 1904 as indicative of the need of such a map as the Millionth Map. *(Rept. 8th Intern. Geogr. Congr. 1904,* p. 556.).]

CANADA

British Columbia-Alberta. Chaîne Canadienne des Rocheuses (Colombie Britannique) d'après les levés les plus récents. 1907-1911. 1:3,000,000. 53°49′-49°45′ N.; 120°6′-115°0′ W. 4 colors. Map No. 1 under America, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Valuable compilation and coordination of all surveys to date, including the recent ones of Collie, Palmer, Wheeler and Longstaff. Relief in brown shading.]

SOUTH AMERICA

Argentine. La Précordillère entre Mendoza et Jachal (Argentine). D'après la carte de R. Stappenbeck (publiée par les "Petermanns Geogr. Mitteilungen." 1911). 1:1,500,000. 29½°-33¼° S.; 71°-68° W. 3 colors. Map No. 3 under America, *Année Cartogr. 9111* (22nd year), Nov. 1912.

[Based on map listed under "Argentina" in *Bull.,* Vol. 43, 1911, p. 707.]

Bolivia. Mapa Telegrafico de Bolivia. Formado por el Director General de Telégrafos Sr. Luis P. Ampuero y colaborado por el Ingeniero Sr. C. Aramayo del Rio con autorización del Ministerio del ramo. 1:2,400,000. 9½°-25½° S.; 71°-57° W. 7 colors. [Dirección General de Estadística], La Paz, 1911.

[Shows telegraph districts and lines, distinguishing in the latter case between those owned by the state and by private companies.]

Brazil. Relevés Hydrographiques dans le Bassin du Xingú et du Tapajoz (Brésil). Voyage de Melle. E. Snethlage. 1:4,000,000. 3°-7° S.; 56¼°-52⅓° W. 1 color. Map No. 2 under America, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Based on the map listed under "Brazil" in *Bull.,* Vol. 44, 1912, p. 717.]

AFRICA

Algeria. Esquisse Géologique et Tectonique du Titteri. [1:300,000.] 36°4′-35°48′ N.; 2°44′-3°50′ E. Pl. V, "Le Titteri: Sa Structure, Son Modélé" by A. Joly, *Ann. de Géogr.,* Vol. 21, 1912 (Nov. 15), pp. 426-451.

[The Titteri is a member of the southernmost range of the Tell Atlas in the longitude of Algiers.]

Cape of Good Hope, etc. International Map 1:1,000,000. South H-34: Kenhardt. 1:1,000,000. 28° - 33° S.; 18° - 24° E. 17 colors. Geographical Section, General Staff, London, Oct. 1911. Price 2s.

[The first sheet of the International Map to be issued of the southern hemisphere. In its predominantly brown coloring it brings out well the plateau character of the country. Unsurveyed contours are shown dotted. All 100-meter contours are shown, although above 600 meters there is separate hypsometric coloring for larger intervals only. No relief shown of the southeastern corner of German Southwest Africa included on this sheet.]

French Equatorial Africa. Carte de la Région Française du Stanley Pool. Par le R. P. Le Gallois. 1:200,000. 3°39′ - 4°33′ S.; 14°34′ - 15°45′ E. Pl. I, "Contribution à la Cartographie du Congo Français: Région du Stanley Pool" by A. Le Gallois, *Ann. de Géogr.*, Vol. 21, 1912 (Jan. 15), pp. 57-69.

[Valuable original map on a relatively large scale based on route traverses by the author. Relief is in contours; interval 50 meters. Woods and trade routes shown. The slightly inaccurate latitudes and longitudes of the map may be corrected according to the astronomical positions communicated in this connection by M. Georges Bruel, Director of the Service Géogr. de l'Afrique Équatoriale Française, in a letter to the *Ann. de Géogr.* (Vol. 21, 1912 (May 15), p. 276).]

French Equatorial Africa-Belgian Congo, etc. Région entre les Rivières Mbomou et Mbokou modifiée d'après les levés de M. Albert Piquet. 1:1,000,000. 5°53′ - 4°35′ N.; 25°45′ - 27°40′ E. 4 colors. Map No. 2 under Africa, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Valuable original map of the easternmost tip of continuous French territory in Africa, based on surveys made in 1909-1911, the first since those of Junker in 1880.]

French Sudan. Les Régions du Ouadaï et de L'Ennedi d'après les travaux les plus récents des officiers du Territoire militaire. 1:5,000,000. 20° - 11° N.; 17° - 23⅔° E. 3 colors. Map No. 3 under Africa, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Valuable map embracing the newer reconnaissance surveys of the French army. Relief in shading.]

French Sudan. (a) Bassin du Sourou, par H. Hubert, d'après les documents officiels des cercles de Bandiagara et de Dédougou, les carte de MMrs. Carrier, pour le Mossi; Vadier, pour l'Yatenga, et les itinéraires de H. Hubert. 1:2,000,000. 14°10′ - 12°7′ N.; 4°10′ - 2°20′ W.

(b) Esquisse de la partie septentrionale du cours du Niger et de la Volta Noire, par Henry Hubert d'après la carte du Gouvernement général de l'Afrique Occidentale française et les travaux de l'Auteur. 1:5,000,000. 18° - 11° N.; 6°50′ W. - 2°45′ E.

Accompany, as Fig. 1 on p. 253 and as Pl. III, "Sur un Important Phénomène de Capture dans l'Afrique Occidentale," by H. Hubert, *Ann. de Géogr.*, Vol. 21, 1912 (May 15), pp. 251-262.

[Map (a), although primarily intended to illustrate a physiographic feature, affords, as does map (b), a valuable delineation of the imperfectly known topography of the region.]

Kamerun, etc. Les Frontières du Cameroun d'après l'Accord Franco-Allemand du 4 Nov. 1911. 1:10,000,000. 13° N. - 2⅓° S.; 8½° - 19⅓° E. 8 colors. Map No. 1 under Africa, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Similar to the map listed under "Kamerun-French Congo, etc., (a)" in *Bull.*, Vol. 44, 1912, p. 157.]

Libya (Tripolitania). Carta dimostrativa della Libia. [By] Pio Galli. 1:1,000,000. 33°25′ - 28°0′ N.; 8°40′ - 26°0′ E. 6 colors. Antonio Vallardi, Milan, [1912.] Price L. 2.50.

[Large-scale map of a semi-mural character showing relief in shading, drainage in blue, oasis vegetation in green, caravan routes and places in red.]

MOROCCO. Maroc Occidental. Louis Gentil: Itinéraires entre l'Oued Tensift et Agadir. 1909-1910. 1:600,000. 32°0' - 30°25' N.; 10°0' - 9°15' W. 3 colors. Map No. 5 under Africa, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Important original map embodying the results of route surveys along the Morrocan Atlantic coast from Agadir (30½° N.) to the Wadi Tensift (32° N.). Relief in brown shading.]

MOROCCO. Maroc: Essai D'Une Carte Géologique. Par Louis Gentil d'après les travaux de l'auteur et divers documents (1911). 1:2,500,000. 37°25' - 28°10' N.; 11°15' W. - 0°10' E. 21 colors. Pl. II, "La Géologie du Maroc et la Genèse de Ses Grandes Chaînes" by L. Gentil, *Ann. de Géogr.*, Vol. 21, 1912 (March 15), pp. 130-158.

[Fundamental geological map of Morocco correlating all previous work. Nine sedimentary and three igneous formations are distinguished, the sedimentary being classified according to whether they have been definitely determined or not. The boundaries of formations are similary distinguished by two kinds of symbols. The excellent map of Morocco in the Atlas Universel de Géographie by Vivien de St. Martin and Fr. Schrader (Sheet 62; listed under "Atlases" (first entry) in *Bull.*, Vol. 43, 1911, p. 312) has been used as the topographic base.]

MOROCCO, ETC. Les Zones d'Influence du Maroc (d'après le Traité secret de 1904 rendu public en nov. 1911). 38° - 25° N.; 15° - 1° W. 5 colors. Map No. 4 under Africa, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Continues the map listed under "Morocco-Rio de Oro, etc.," in *Bull.*, Vol 44, 1912, p. 157, in that it shows parts of the territory originally claimed by Spain (the valley of the Wergha south of the Rif and the hinterland of Ifni on the coast in 29½° N.) which were returned to France by the arrangement of October 1912.]

NORTHERN NIGERIA. Bauchi Mines Survey. Naraguta Sheet. 1:25,000. 10° - 3.5' - 9°55.7' N.; 8°48.9' - 8°59.5' E. 2 colors. Geographical Section, General Staff, [Publication] No. 2580. Printed at the Ordnance Survey Office, Southampton, 1911.

[Detailed contour map (interval 50 feet) of part of the Bauchi Plateau, valuable for its tin mines. Boundaries of mining grants shown.]

ASIA

CHINA-TIBET-INDIA. Himalaya et Se-Tchouen. 1:5,000,000. 31⅓° - 24° N.; 87⅔° - 104⅔° E. 8 colors. Map No. 3 under Asia, *Année Cartogr. 1911*, (22nd year), Nov. 1912.

[Incorporates results of route surveys of I. C. White in Sikkim and Bhutan, 1906-08; of Brunhuber and Schmitz in Yunnan, 1909 (map listed under "Chinese Empire-India," in *Bull.*, Vol. 44, 1912, p. 238); of Capt. Audemard along the upper Yangtzekiang, 1910 (map listed under "China" (first entry), *Bull.*, Vol. 44, 1912, p. 79); of the Mission Legendre in Szechuan, 1910-11; and of Capt. F. M. Bailey across the constricted upper courses of the Yangtzekiang and the Mekong and Salween Rivers (map listed under "Tibet-India" in *Bull.*, Vol. 44, 1912, p. 559).]

SIBERIA. Péninsule Yamal d'après les levés de l'expédition Jitkoff. 1908. 1:5,000,000. 73⅔° - 66⅙° N.; 65⅓° - 76° E. 3 colors. Map No. 1 under Asia, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Based on map listed under "Siberia," *Bull.*, Vol. 44, 1912, pp. 238-239.]

TURKEY IN ASIA. Asie Turque. 1:5,000,000. 40½° - 33½° N.; 32⅓° - 43⅓° E. 4 colors. Map No. 2 under Asia, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Shows itineraries of Dr. von Oppenheim (maps listed under "Turkey in Asia" in *Bull.*, Vol. 43, 1911, p. 798, and Vol. 44, 1912, p. 79), of R. Campbell Thompson, and of Ewald Banse (map listed under "Mesopotamia" in *Bull.*, Vol. 43, 1911, p. 310).]

TURKEY IN ASIA-PERSIA, ETC. (A historical map of Armenia and the adjacent regions. By G. Vardanian. 1:800,000. 42¼° - 35° N.; 33° - 50° E. With two insets: (1) (Asia Minor). 1:5,400,000. 3 colors. (2) (Western Persia and Mesopotamia). 1. 5,400,000. 3 colors. Published by G. J. Galustiana, Tiflis, 1911.

[Wall map in Armenian characters. Political boundaries in colors. Relief in brown hachuring.]

AUSTRALASIA AND OCEANIA

AUSTRALASIA. Anciennes extensions continentales de l'Australasie, d'après les travaux de Ch. Hedley. 1:60,000,000. 2° - 55° S.; 138° - 178° E. Accompanies, as Fig. 1 on p. 370, "La Faune Marine de l'Australasie et les Anciennes Extensions Continentales d'après quelques travaux récents" by L. Germain, *Ann. de Géogr.*, Vol. 21, 1912 (July 15), pp. 369-372.

AUSTRALASIA AND WESTERN OCEANIA. Carte des Bancs et Récifs de Coraux (Madrépores). Dressée sous les auspices de S. A. S. Le Prince Albert 1er de Monaco par M. L. Joubin, Professeur au Museum d'Historie Naturelle et à l'Institut Océanographique. Executée par M. J. Morelli, Dessinateur au Service Hydrographique de la Marine. 1912. [Mercator's projection: equatorial scale] 1:10,000,000. 32° N. - 32° S.; 108° - 180° E. 3 colors. Pl. IV, "Sur une Carte des Récifs de Coraux" by L. Joubin, *Ann. de Géogr.*, Vol. 21, 1912 (July 15), pp. 289-293.

[Important map: one of five sheets constituting an atlas of the distribution of corals over the world by the same author, accompanying No. 2 of Vol. 4 of the *Ann. de l'Inst. Océanogr.*, Monaco, 1912. Distinction is made between reefs above water and submerged reefs. The base used is the corresponding part of the Carte Générale Bathymétrique des Océans.]

NEW GUINEA. Nouvelle-Guinée d'après les cartes de l'Amirauté anglaise, de l'atlas colonial allemand, de l'atlas colonial hollandais et les itinéraires les plus récents. 1:10,000,000. ½° N. - 10⅔° S.; 130⅓° - 151⅓° E. 5 colors. Map No. 4 under Asia, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Welcome compilation affording a survey of the advance made in the exploration of the interior of New Guinea by the frequent expeditions of recent years.]

QUEENSLAND. (Carte des) Bassins des Rivières Barron et Russell. 1:800,000. 16°40' - 17°33' S.; 145°18' - 146°8' E. Accompanies, as Fig. 1 on p. 349, "La Région des Rivières Barron et Russell (Queensland)" by J. V. Daneš, *Ann. de Géogr.*, Vol. 21, 1912 (July 15), pp. 346-363.

[First representation of the relief of this region. Generalized contours used; interval 250 meters.]

QUEENSLAND. Queensland showing the main roads, railway lines, telegraph lines and stations and government artesian bores and tanks. 1:2,534,400. 9° - 30° S.; 137° - 154° E. Survey Dept. of Public Lands, Brisbane, Jan. 1911. Price 2/6.

[Valuable mainly because of relatively large scale and copious nomenclature. Relief not shown.]

EUROPE

FRANCE. (a) Plan schématique du port de Caen et du canal maritime. 1:120,000. [49°20' N. and 0°20' W.] Oriented N. 51° W.

(b) Le bassin minier de Basse-Normandie. 1:700,000. 49°30' - 48°30' N.; 1° W. - 0°. With inset on same scale: [N. W. part of Cotentin Peninsula.]

Accompany, as Figs. 1 and 3, on pp. 215 and 224, respectively, "Le Port de Caen et les Mines de Fer de Basse-Normandie" by Y. Lemarec, *Ann. de Géogr.*, Vol. 21, 1912 (May 15), pp. 213-229.

[Map (b) shows coal mine grants, distinguishing between those exploited and those not yet exploited in 1911.]

France-Belgium, etc. Carte de la Terre au 1,000,000e: (Europe) Nord M 31: Paris. 1:1,000,000. 52° - 48° N.; 0° - 6° E. 10 colors. Service Géographique de l'Armée, Paris, Sept. 1911. Price, frs. 1.60.

[Brings out well the lowland character of the plain of northern France and of the Low Countries. Comparison with such sheets for instance, as South H-34, listed above under "Cape of Good Hope, etc.," demonstrates the high value of the International Map in the formation of proper geographic conceptions. The contours on the Continent are somewhat too generalized, due, probably, to the small scale of the material used in compilation. The addition of the 50 meter contour expressly allowed by the resolutions of the International Map Committee would have enhanced the value of the representation of the Low Countries.]

Italy. Carte des précipitations annuelles dans la région du golfe de Gênes. 1:2,000,000. [45°12' - 43°33' N.; 6°20' - 11°10' E.] Accompanies, as Fig. 1 on p. 269, "La Pluie dans la Région Ligurienne" by G. Anfossi, *Ann. de Géogr.*, Vol. 21, 1912 (May 15), pp. 268-271.

[Based on a more extended publication by the same author on the same subject, constituting No. 17 of the *Memorie Geografiche,* supplements to the *Riv. Geogr. Ital.* Seven degrees of precipitation shown.]

Turkey-Bulgaria, etc. International Map. Europe 1:1,000,000. North K 35: Istambul (Constantinople). 1:1,000,000. 44° - 40° N.; 24° - 30° E. 15 colors. Geographical Section, General Staff, London, Jan. 1912. Price 2s.

[Excellent general representation of the region shown which, it chances, can serve very well in studying the geographic questions brought up by the Balkan War. Unfortunately the requirement of the International Map Committee has not been followed in the number of isobaths shown, none being shown below 200 meters, thus precluding an adequate representation of the southwestern part of the Black Sea, the Sea of Marmora and the northeastern part of the Aegean, included on this sheet.]

Western Europe. (a) Fonds géologiques d'une partie de la Manche. 1:2,500,000. 50⅔° - 48½° N.; 5¼° - 1½° W.

(b) Fonds géologiques de l'Atlantique à l'Ouest de l'Europe. 1:20,000,000. 63° - 35° N.; 18° W. - 3° E.

Accompany, as Figs. 1 and 2 on pp. 387 and 389, respectively, "La Géologie du Fond des Mers: Manche et Atlantique Nord" by P. Lemoine, *Ann. de Géogr.*, Vol. 21, 1912 (Nov. 15), pp. 385-392.

[Shows, in generalized form, the geology of the surrounding lands and the locations of submarine formations whose geological age has been determined.]

POLAR

Antarctic. La Découverte du Pôle Sud par Roald Amundsen. 1911. 1:50,000,000. Polar cap approximately within 40° S. 3 colors. On same sheet as maps of America, *Année Cartogr. 1911* (22nd year), Nov. 1912.

[Shows route of the *Fram* from Kerguelen to the Ross Barrier and, returning, from the Barrier to Hobart and Buenos Aires.]

EDUCATIONAL

Scotland. Bathy-Orographical Map of Scotland. 1:380,000. 58⅔° - 54⅔° N.; 7⅘° - 1½° W. 15 colors. With one inset: [Shetland and Orkney Islands]. [1:1,140,000]. 11 colors. W. & A. K. Johnston, Edinburgh, [1912.]

[Effective hypsometrical wall map belonging to the series of bathy-orographical school wall maps of which other maps were reviewed under "Educational" in *Bull.*, Vol. 42, 1911, p. 879, and Vol. 43, 1912, p. 240. Eight tints are used to represent the relief of the land and six to represent that of the sea. A useful innovation for this series is the representation of the principal towns and railroads in red.]